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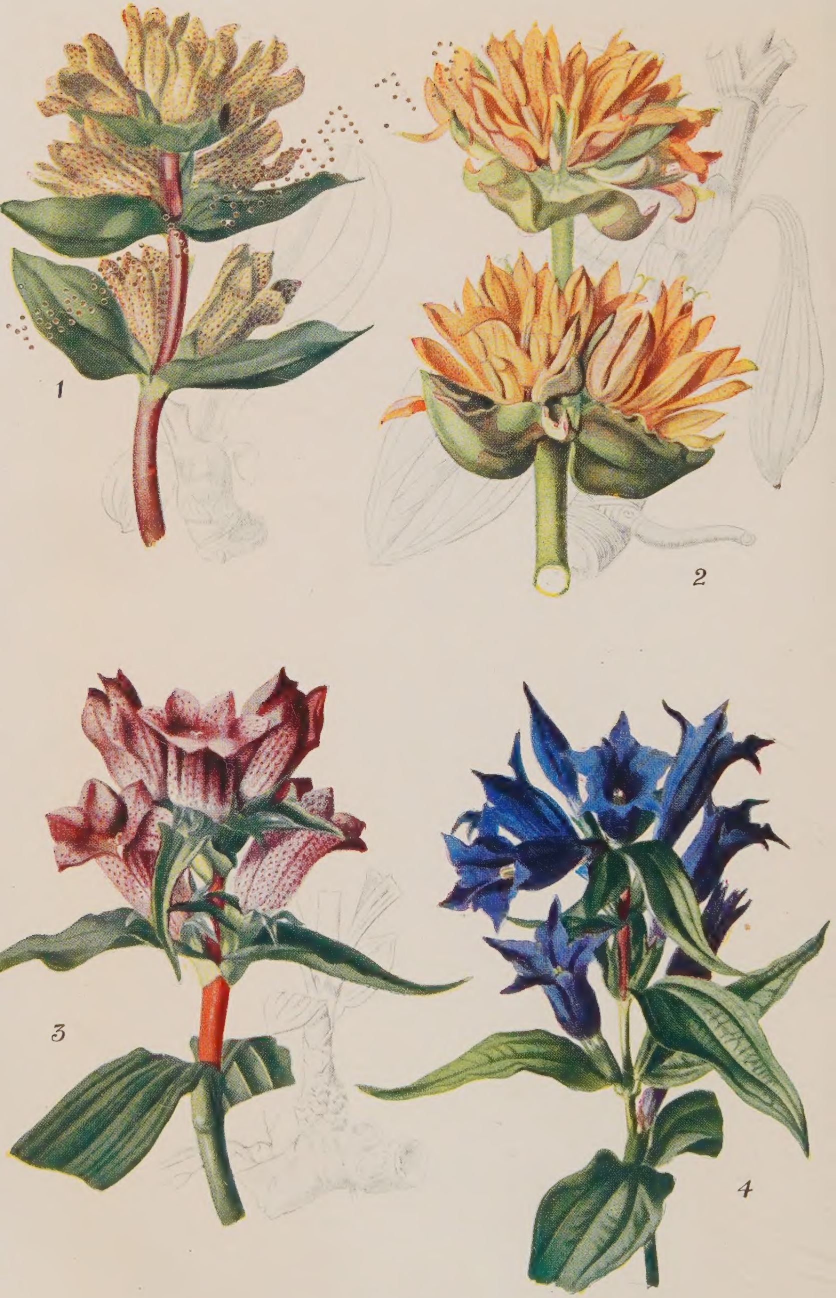

PLATE L.

1. Gentiana punctata L.
2. Gentiana lutea L.
3. Gentiana pannonica Scop.
4. Gentiana asclepiadea L.

ALPINE PLANTS OF EUROPE

TOGETHER WITH CULTURAL HINTS

BY

HAROLD STUART THOMPSON, F.L.S.

WITH 64 COLOURED PLATES (311 FIGURES)

LONDON
GEORGE ROUTLEDGE AND SONS, LIMITED
NEW YORK: E. P. DUTTON AND CO.

"And on the green knees of those giant scars,
Ages ere man arose to mark the hours,
The dawn descending kissed awake blue stars
Of Gentians, and all tender Alpine flowers."
F. W. BOURDILLON.

"The sense of independence, of self-confidence, induced by the great precipices and vast silent fields of snow is something wholly delightful. Every step is health, fun and frolic. The troubles, cares of life, together with the essential vulgarity of a plutocratic society, are left far below, foul miasmas that cling to the lowest bottoms of the reeking valleys. Above, in the clear sky and searching sunlight, we are afoot with the quiet gods, and men know each other and themselves for what they are."—A. F. MUMMERY.

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PREFACE

This book owes its origin chiefly to the fact that there is no well-illustrated work in the English language descriptive of the Flowering Plants of the whole range of the Alps.

The aim has been to give botanical descriptions of the more beautiful and interesting species indigenous to the High Alps and other mountains of Europe, and some which are found chiefly in subalpine districts, together with a few Southern rock-plants which are particularly suitable for cultivation in rock-gardens, but which should never be called ' Alpine ,' as is too often the case. Some 700 species, and a few marked varieties, are here described.

The author has had the opportunity of using the beautiful illustrations of Alpine flowers painted from nature by Joseph Seboth, and he has added a couple of small drawings of his own.

Many of the descriptions are based upon specimens in his own herbarium, while much help has been got from the late Alfred W. Bennett's text to Seboth's *Alpine Plants*, Schinz and Wilczek's *Flore de la Suisse*, and Coste's *Flore de la France*. Bentham's *Handbook of the British Flora* has been found helpful in framing synopses of the characters of the families and genera.

In a book of this character it was thought better to give the names that have been countenanced by long usage rather than to rigidly adhere in every case to the earliest names of genera and species, particularly as botanists are divided in their views as to the desirability of adopting all the Rules of Nomenclature that were passed at the Vienna Congress in 1905. Where new names have been given, a better known synonym has usually been added. It is, however, not expected that the majority of those to whom this book may be useful would be disposed to indulge in profitless wrangling over abstruse questions of nomenclature: they will rather be satisfied with one of the correct and best known names for their plants, which have already far too many synonyms.

The paucity of English names is explained by the fact that the great majority of the plants described do not occur in Britain, that several popular books published on the Continent have been disfigured by the creation of impossible English names, and that, generally speaking, it is as easy to remember the universally used Latin names as it is to adopt ill-defined and unsatisfactory English ones.

When not otherwise stated, every species is believed to be perennial; and, although it is hoped the short cultural notes added to many of the plants worthy of cultivation may be useful to some who are starting rock-gardens, that part of the work is quite secondary to the botanical side. A number of plants rarely or never seen in English gardens are recommended for introduction.

The terms 'Eastern,' 'Central,' and 'Western' Alps may need some slight explanation. These divisions are roughly those adopted both in the late John Ball's famous *Alpine Guide*, the best guide to the Alps in any language, and in Mr. Coolidge's *The Alps in Nature and History* (1908), one of the most useful and informing of Alpine books. These two authorities have defined the WESTERN ALPS as extending from the Col de Tenda to the Simplon Pass in Southern Switzerland. The Col de Tenda divides the Maritime Alps from the Ligurian Mountains at the back of Bordighera and San Remo, and carries the high road from Nice or Ventimiglia to Cuneo and Turin. Thus the Western Alps are chiefly in France and Italy, but they also comprise that part of Switzerland which is south of the Rhone.

The CENTRAL ALPS include the greater part of Switzerland, north and east of the Simplon, though not the highest Swiss mountains, the small portion of Tyrol west of the Reschen

Scheideck Pass and the bit of Alpine Lombardy to the south.

The Eastern Alps comprise the rest of the Alpine ranges to the east of the Reschen Scheideck and the Stelvio; and are wholly Austrian and Italian, except for the limestone hills of Bavaria in the north.

The author may be allowed to take this opportunity for expressing his thanks for much kindness received in the past when working at the Alpine flora at l'Herbier Boissier, the Conservatoire Botanique, and the Candollean Herbarium at Geneva; and for similar kindness on shorter visits paid to the botanical establishments at Turin, Genoa, and Paris. He desires also to express his indebtedness to the botanical staff at the British Museum and to that at Kew Gardens.

HAROLD STUART THOMPSON

March 1911.

CONTENTS

PART I

CHAPTER I

PAGE
WHAT ARE ALPINE PLANTS? 1

CHAPTER II

ALPINE PLANTS IN THEIR NATIVE HAUNTS—SOME CHARACTERISTICS, ETC. 7

CHAPTER III

THE CULTIVATION OF ALPINE PLANTS 13

CHAPTER IV

ON COLLECTING AND PRESSING ALPINE FLOWERS . . 21

PART II

DICOTYLEDONS 25
MONOCOTYLEDONS 236
GYMNOSPERMÆ 260
VASCULAR CRYPTOGAMS 263
A GLOSSARY OF BOTANICAL TERMS 265
INDEX 275

ERRATA

Page 5, line 1, for "Mount" read "Mont."
„ 18 „ 32 „ "*Blagyana*" read "*Blagayana.*"
„ 82 „ 27 „ "*Silene pumilio*" read "*Silene Pumilio.*"
„ 278 „ 2 (Chrysanthemum alpinum), add "p. 159."

LIST OF THE SIXTY-FOUR COLOURED PLATES

PLATE FACING PAGE

I. Atragene alpina, Thalictrum alpinum, Anemone Halleri, Thalictrum aquilegifolium . . . 24

II. Anemone vernalis, Ranunculus aconitifolius, Ranunculus pyrenæus, Anemone baldensis, Anemone narcissiflora 28

III. Ranunculus Seguieri, Anemone alpina, Ranunculus glacialis, Ranunculus alpestris, Ranunculus parnassifolius 30

IV. Papaver alpinum, Ranunculus Traunfellneri, Aconitum paniculatum, Ranunculus rutæfolius, Ranunculus crenatus 38

V. Ranunculus montanus, Aquilegia alpina, Ranunculus Thora, Papaver aurantiacum . 44

VI. Arabis alpina, Arabis pumila, Arabis cœrulea, Arabis serpyllifolia, Cardamine alpina . . 48

VII. Cardamine resedifolia, Sisymbrium pinnatifidum, Kernera saxatilis, Cardamine asarifolia . . 52

VIII. Petrocallis pyrenaica, Hutchinsia alpina, Draba carinthiaca, Thlaspi alpinum, Alyssum Wulfenianum 58

IX. Morisia hypogœa, Thlaspi rotundifolium, Draba Sauteri, Draba aizoides, Biscutella lævigata . 66

X. Viola pinnata, Helianthemum alpestre, Viola biflora, Helianthemum canum . . . 68

XI. Viola lutea, Viola calcarata, Viola alpina, Polygala alpestris, Polygala Chamæbuxus . . 72

XII. Moehringia muscosa, Lychnis alpina, Silene Pumilio, Dianthus alpinus, Dianthus glacialis . 74

XIII. Gypsophila repens, Silene alpestris, Silene acaulis, Silene quadrifida, Silene rupestris . . . 78

XIV. Alsine lanceolata, Silene Saxifraga, Cerastium uniflorum, Cerastium latifolium, Alsine Cherleri, Alsine laricifolia 84

PLATE FACING PAGE
XV. Arenaria grandiflora, Cerastium alpinum, Arenaria ciliata, Arenaria biflora, Moehringia Ponæ . 86
XVI. Linum alpinum, Hypericum nummularium, Geranium macrorrhizum, Geranium argenteum, Geranium phœum 94
XVII. Astragalus alpinus, Phaca frigida, Cytisus alpinus, Oxytropis campestris, Trifolium alpinum . 100
XVIII. Oxytropis Halleri, Oxytropis pilosa, Oxytropis triflora, Phaca alpina, Oxytropis montana . 106
XIX. Rosa alpina, Alchemilla alpina, Potentilla nivea, Potentilla caulescens 110
XX. Potentilla minima, Potentilla grandiflora, Potentilla aurea, Potentilla Clusiana . . . 112
XXI. Potentilla nitida, Geum reptans, Dryas octopetala, Geum montanum 116
XXII. Sempervivum Wulfenii, Sedum roseum, Sedum atratum, Sempervivum Döllianum, Epilobium alpinum, Sempervivum Funkii . . . 118
XXIII. Sempervivum arenarium, S. fimbriatum, S. montanum, S. arachnoideum, S. Huteri, S. dolomiticum 120
XXIV. Saxifraga petræa, S. rotundifolia, S. cernua, S. aspera, S. bryoides, S. biflora . . . 124
XXV. Saxifraga stellaris, S. Seguieri, S. cuneifolia, S. hieracifolia, S. moschata, S. Androsacea, S. azioides. 126
XXVI. Saxifraga oppositifolia, S. Murithiana, S. mutata, S. crustata, S. Aizoon 128
XXVII. Saxifraga squarrosa, S. lantoscana, S. Tombeanensis, S. Cotyledon 130
XXVIII. Saxifraga cæsia, S. Vandelli, S. Burseriana, S. altissima 134
XXIX. Astrantia major, Bupleurum stellatum, Eryngium alpinum, Bupleurum ranunculoides . 140
XXX. Meum Mutellina, Linnæa borealis, Astrantia minor, Athamanta cretensis 144
XXXI. Valeriana tripteris, V. montana, Scabiosa lucida, Valeriana saliunca, V. supina, V. saxatilis, V. celtica 148
XXXII. Adenostyles albifrons, Homogyne silvestris, Adenostyles alpina, Homogyne discolor . 150
XXXIII. Leontopodium alpinum, Erigeron Villarsii, Gnaphalium supinum, Aster alpinus, Homogyne alpina 154

PLATE FACING PAGE
XXXIV. Bellidiastrum Michelii, Chrysanthemum alpinum, Antennaria carpatica, Achillea moschata . 158
XXXV. Achillea atrata, Artemisia spicata, Doronicum cordatum, Artemisia Mutellina, Achillea nana, Achillea Clusiana 160
XXXVI. Arnica montana, Senecio abrotanifolius, S. incanus, S. carniolicus, Aronicum Clusii . . 162
XXXVII. Cineraria aurantiaca, Cineraria alpestris, Cirsium spinosissimum, Saussurea pygmœa . . 164
XXXVIII. Centaurea montana, Scorzonera rosea, Hypochæris uniflora, Hieracium aurantiacum . 166
XXXIX. Leontodon Taraxaci, Hieracium lanatum, Crepis aurea, Hieracium villosum 170
XL. Phyteuma comosum, P. hemisphericum, Campanula rhomboidalis, Phyteuma pauciflorum, P. Sieberi, P. humile 174
XLI. Campanula Zoyzii, C. pulla, C. carnica, C. cenisia, C. Morettiana 178
XLII. Campanula thyrsoidea, C. Raineri, C. alpina, C. barbata, C. pusilla 180
XLIII. Erica carnea, Rhododendron hirsutum, Azalea procumbens, Rhododendron ferrugineum . 184
XLIV. Rhododendron Chamæcistus, Pyrola uniflora, Pyrola rotundifolia, Armeria alpina . . 186
XLV. Primula farinosa, Androsace carnea, A. Wulfeniana, A. helvetica, A. Chamæjasme . . 188
XLVI. Androsace obtusifolia, A. villosa, Cortusa Matthioli, Soldanella pusilla, Androsace lactea . 190
XLVII. Primula glutinosa, P. marginata, P. Auricula, P. minima, P. spectabilis, Aretia Vitaliana . 192
XLVIII. Cyclamen europæum, Primula tiroliensis, Soldanella minima, S. alpina, Primula commutata, P. viscosa Vill. 198
XLIX. Gentiana nana, Pleurogyne carinthiaca, Swertia perennis, Eritrichium nanum, Myosotis alpestris 200
L. Gentiana punctata, G. lutea, G. pannonica, G. asclepiadea. . . . . . . *front.*
LI. Gentiana obtusifolia, G. frigida, G. Clusii, G. excisa, G. brachyphylla 202
LII. Gentiana utriculosa, G. bavarica, G. verna, G. nivalis 206
LIII. Gentiana pumila, G. imbricata, G. prostrata, G. tenella, Polemonium cœruleum . . . 208

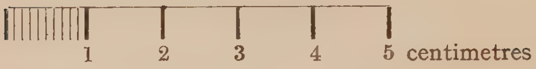
PLATE FACING PAGE
LIV. Linaria alpina, Tozzia alpina, Wulfenia carinthiaca, Erinus alpinus 210
LV. Veronica aphylla, V. fruticulosa, V. alpina, V. saxatilis, Pedicularis verticillata . . 214
LVI. Pedicularis incarnata, P. rostrata, P. asplenifolia, P. acaulis 218
LVII. Pedicularis Oederi, P. Jacquinii, P. foliosa, P. rosea, P. elongata 220
LVIII. Pinguicula vulgaris, Calamintha alpina, Globularia cordifolia, Horminum pyrenaicum, Pinguicula alpina 222
LIX. Betonica Alopecurus, Scutellaria alpina, Dracocephalum Ruyschiana, Ajuga pyramidalis . 226
LX. Daphne alpina, Daphne Blagayana, Polygonum viviparum, Daphne striata, Alnus viridis, Oxyria digyna, Salix reticulata . . . 230
LXI. Orchis globosa, O. sambucina, Gymnadenia odoratissima, G. conopsea 236
LXII. Pinus montana, Cypripedium Calceolus, Chamæorchis alpina, Gymnadenia albida, Nigritella rubra 238
LXIII. Polygonatum verticillatum, Narcissus poeticus, Carex atrata, Paradisia Liliastrum, Crocus albiflorus 240
LXIV. Gagea Liottardi, Lloydia serotina, Allium Victorialis, Veratrum album, Juncus trifidus . 244

ABBREVIATIONS OF AUTHORS' NAMES

A. Br. = Alexander Braun
Adans. = Adanson
A. DC. = Alphonse de Candolle
Ait. = Aiton
All. = Allioni
Anders. = Anderson
Anderss. = Andersson
Ard. = Arduino
A. T. or Arv. T. = Arvet-Touvet
Asch. = Ascherson
A. et Graeb. = Ascherson et Graebner
Bab. = Babington
Bad. = Badarro
Balb. = Balbis
Bart. or Bartl. = Bartling
Bast. = Bastard
Baumg. = Baumgarten
Bell. = Bellardi
Benth. = Bentham
Berg. = Bergeret
Bernh. = Bernhardi
Bert. = Bertolini
Bess. = Besser
Bieb. = Marschall von Bieberstein
Bluff et Fing. = Bluff et Fingerhut
Boiss. = Boissier
Boiss. et Reut. = Boissier et Reuter
Bor. = Boreau
Briq. = Briquet
Brot. = Brotero
R. Br. = Robert Brown
Burn. = Burnat
Burn. et Grem. = Burnat et Gremli
Cass. = Cassini
Chab. = Chabert
Chod. = Chodat
Clairv. = Clairville
Coss. et G. = Cosson et Germain
Crép. = Crépin
Curt. = Curtis
Cuss. = Cusson
DC. = De Candolle (A. P.)
Degl. = Degland
De Not. = De Notaris
Desf. = Desfontaines
Desr. = Desrousseaux
Desv. = Desvaux
Dum. = Dumortier
Dun. = Dunal
Ehrh. = Ehrhart
Endl. = Endlicher
Engel. = Engelmann
Fenz. = Fenzl
Fisch. = Fischer
Forsk. = Forskal
Fouc. = Foucaud
Fouc. et R. = Foucaud et Rouy
Fr. = Fries
Froel. = Froelich
Gaertn. = Gaertner
Gaud. = Gaudin
Genev. = Genevier
G. G. or Gren. et Godr. = Grenier et Godron
Gmel. = Gmelin
Godr. = Godron
Good. = Goodenough
Griseb. = Grisebach
Guss. = Gussone
Hack. = Hackel
Hall. = Haller
Hartm. = Hartmann
Hausm. = Hausmann
Heg. = Hegetschweiler
Heynh. = Heynhold
Hoff. or Hoffm. = Hoffmann
Hook. = Hooker
Huds. = Hudson
Jacq. = Jacquin
Jord. = Jordan
Juss. = Jussieu (A. L. de)
K. = Koch
Kalt. = Kaltenbach
Kern. = Kerner
Kit. = Kitaibel

K. et S. =Koch et Sonder
Krock. =Krocker
Kütz. =Kützing
L. or Lin. =Linnæus (Linné)
Lach. =Lachenal
Lagg. =Lagger
Lam. or Lamk. =Lamarck
Lamb. =Lambert
Lapeyr. =Lapeyrouse
Lej. =Lejeune
Less. =Lessing
Leyss. =Leysser
L'Hérit. =L'Héritier
Lightf. =Lightfoot
Lindl. =Lindley
Lk. =Link
Loefl. =Loefling
Lois. or Loisel. =Loiseleur
M. B. or M. Bieb. =Marschall von Bieberstein
Merc. =Mercier
C. A. Mey. =Carl Anton Meyer
E. Mey. =Ernst. Meyer
Michx. =Michaux
Mich. =Micheli
Mill. =Miller
Morett. =Moretti
P. J. M. =P. J. Müller
Mert. et K. =Mertens et Koch
M. et K. =Mertens et Koch
Murr. =Murray
Neck. =De Necker
Not. =Notaris (De)
Nym. =Nyman
Panz. =Panzer
Parl. =Parlatore
P. Br. =Patrick Browne
P. B. or P. Beauv. =Palisot de Beauvois
Perr. et Song. =Perrier et Songer
Pers. =Persoon
Peterm. =Petermann
Poir. =Poiret
Poll. =Pollich
Pourr. =Pourret
R. Br. =Robert Brown
Rchb. or Reichb. =Reichenbach
Retz. =Retzius
Reut. =Reuter
Reyr. =Reynier
Rich. =Richard
Rottb. =Rottboell
Rupp. =Ruppius
R. et S. =Roemer et Schultes
Salisb. =Salisbury
Saut. =Sauter
Schimp. =Schimper
F. Schulz. =Friedr. Schultz
Sch. Bip. =Schultz Bipontinus
Schk. =Schkuhr
Schleich. =Schleicher
Schleid. =Schleider
Schult. =Schultes
Scop. =Scopoli
Seb. et Maur. =Sebastiani et Mauri
Ser. =Seringe
Shuttle. =Shuttleworth
Sibth. =Sibthorp
Sieb. =Sieber
Sm. =Smith
Spr. or Spreng. =Sprengel
Steph. =Stephani
Sternbg. =Sternberg
Steud. =Steudel
Sw. =Swartz
Ten. =Tenore
Thom. =Thomas
Thuill. =Thuiller
Thunbg. =Thunberg
Tin. =Tineo
Tiss. =Tissière
Tourne. =Tournefort
Trin. =Trinius
Urv. =d'Urville
Vail. =Vaillant
Vauch. =Vaucher
Vill. =Villars
Vis. =Visiani
Viv. =Viviani
Wahl. or Wahlen. =Wahlenberg
Wallr. =Wallroth
Weigl. =Weigel
Wettst. =de Wettstein
Willd. =Willdenow
W. et K., W. et Kit., Waldst. et Kit. =Waldstein et Kitaibel
W. et N. =Weihe et Nees
With. =Withering
Wulf. =Wulfen

SCALE OF MEASUREMENT



SOME USEFUL FIGURES

1 Metre = 3·281 English feet
10 Centimetres = 4 inches (almost)
7 Millimetres = ¼ inch

100 feet = 30½ metres (about)
1,000 ,, = 305 ,, ,,
2,000 ,, = 610 ,, ,,
3,000 ,, = 915 ,, ,,
4,000 ,, = 1220 ,, ,,
5,000 ,, = 1525 ,, ,,
6,000 ,, = 1830 ,, ,,
7,000 ,, = 2135 ,, ,,
8,000 ,, = 2440 ,, ,,
9,000 ,, = 2745 ,, ,,
10,000 ,, = 3048 ,, ,,
11,000 ,, = 3353 ,, ,,
12,000 ,, = 3658 ,, ,,
13,000 ,, = 3960 ,, ,,
14,000 ,, = 4265 ,, ,,

Mont Blanc is 15,782 feet = 4810 metres

ALPINE PLANTS OF EUROPE

PART I

CHAPTER I

WHAT ARE ALPINE PLANTS?

Although an 'alp' is a mountain pasture used in summer for cattle-grazing, and the term 'alpine' was originally and for many centuries applied to any part of a mountain where cattle could graze, the force of custom has attached a different meaning to the word. It now signifies the part of a mountain above the limit of timber trees; and it should be understood that this somewhat modern meaning is the one implied in this book, and that the term 'subalpine' for the lower mountain regions is used in its generally accepted sense, though originally this zone also was embraced in the word 'alpine.'

The words *voralp* or *vorsass*, though not used in these pages, may be briefly explained as being applicable to a pasture grazed by cows in spring before they go up to the 'alp' proper. These mountain slopes between the houses in an Alpine valley and the 'alp' itself were originally owned in common; but now they are generally in the hands of individuals. The higher 'alps' in Switzerland are either owned by the Commune, or by several proprietors, or more rarely by one individual.

It is unfortunate, but not surprising, that when botanists have attempted to define the Alpine zone within rigid limits different conclusions have been arrived at by various observers. For example, the late John Ball, one of the founders of the Alpine Club, who devoted many years to the question of the distribution of plants on the south side of the Alps, divided the Alps into four zones:—(i.) *The Region of Deciduous trees;*[1] the upper limit is about 4000 feet on the north side of the Alps, and often rises to 5500 feet on the southern slopes. (ii.) *The Subalpine Region* or *Region of Coniferous trees*, which extends to about 6000 feet in Switzerland. (iii.) *The Alpine Region*, which has its limits in the Northern Alps, between 6000 and 8000 feet, and at least 1000 feet higher on the south slopes. (iv.) *The Glacial Region*, comprising all that portion above the limit of perpetual snow.

---

[1] The Beech is usually the highest deciduous tree in the Alps and the Birch in Scandinavia, where it often extends above the Pines.

Dr. Christ,[1] the eminent Swiss authority, and Prof. Kerner, of Vienna, called the Alpine zone the whole region above the limit of Coniferous trees (Pine, Spruce, and Larch).

One of the most recent English writers on the Swiss flora, Mr. Newell Arber, in his interesting volume on *Plant Life in Alpine Switzerland*, says the Alpine zone may be regarded as beginning roughly at a height of 5000 feet, at which elevation the Beech as a rule ceases to flourish, and Coniferous forests of Spruce, Pine, and Larch replace it. Mr. Arber thinks it as natural a dividing line as can be found, for it is also at this height that such physical conditions as shortness of the flowering season and intensity of the illumination are typically in force. In addition there are biological reasons which favour it.

Prof. C. Schroeter, of Zürich, has published a comparative table, showing how no less than twenty-five botanists, between 1808 and 1904, have tried to subdivide Swiss vegetation in regard to altitude, and that no two schemes agree even remotely.

If, therefore, it is impossible to define zones of altitude at all rigidly in regard to the vegetation of a small country like Switzerland, how much more impossible it is to do so for the whole range of the Alps dealt with in this book, extending as it does almost from the Mediterranean, right round the northern frontier of Italy, through Tyrol to Carinthia and Styria !

Of the term ‘ subalpine ’ it is also impossible to give an exact definition, but it may be taken for the purposes of this book to be the zone from about 3000 feet, where the vine ceases to be cultivated, to about 5000 feet. All below the subalpine is described as the lowlands or the plains. By far the greater number of plants described in this volume are true ‘ Alpines,’ in so far as they have their dwelling-place especially above the limit of timber-trees, though many of them descend lower, and not a few may occasionally be found even in the plains.

It should be noticed also that the heights given in the text refer more especially to the Alps, and not to the Pyrenees or Carpathians, and still less to Scandinavia or the Arctic regions, for most of the plants common to the Alps and the Arctic regions flourish in the northern climate at very much lower elevations, and sometimes almost at sea level. For example, *Saxifraga oppositifolia* grows at 12,450 feet on the Grivola and at sea level in Spitzbergen ; *Ranunculus glacialis* accompanies the Saxifraga in

[1] *La Flore de la Suisse et ses Origines* (1883).

Spitzbergen, and has been seen at 14,100 feet on the Finsteraarhorn! Many striking examples are thus afforded of the relation between altitude and latitude. But we need not go to Spitzbergen, nor even to Norway, to see examples of this relationship, for in Great Britain and in Ireland there are many true Alpine plants, such as *Dryas octopetala* and *Gentiana verna*, which descend either to sea level or in other cases to less than a thousand feet above.

I have found, in the course of extensive travel in many parts of the Alps, Pyrenees, and other ranges, the variability of the zone of Coniferous trees in different latitudes and in different climates and conformations, a most perplexing study. It seems to vary considerably more than the line of perpetual snow varies in countries adjacent to each other, and it is obvious to the most casual observer that the snow-line is some hundreds of feet higher on the south side of the main Pennine Alps than, let us say, in the Bernese Oberland.

It does not follow that in the hot mountainous regions of Southern Europe the Coniferous trees either begin or end at higher elevations than in the colder climate of Switzerland. For example, on one of the mountains of Liguria, about 6400 feet above the Mediterranean, the upper limit of Olive trees is about 1800 feet,[1] then a belt of Spanish Chestnut extends to 3000 feet, where Pines begin, and at 5000 feet are the highest 'alps' or mountain pastures. On the cliffs above the pastures there are again some Conifers, but they are mostly in the nature of outliers. Again, on the north side of the Eastern Pyrenees, in certain places the belt of Conifers is from about 5500 to 6700 feet above the sea, which more approximates the state of things in the south of Switzerland than that in Liguria or the Maritime Alps in almost the same latitude as the Pyrenees. Such uncertain or unexpected facts as these relating to the forests must naturally affect the flowers also.

It is true that some of the Alpine plants are found in more or less clearly defined zones or belts, yet a great many have an extremely wide vertical range even locally, and a still wider one when an extensive area like the whole Alpine chain is taken into consideration. As more attention has been paid to altitude than is usual in books of this character, the student is asked to bear in mind the facts just stated, and to understand that figures such as are given are only useful as a guide; that they vary in different countries, and even in adjacent districts, and are sometimes based purely upon the writer's own experience, which has been gained more in the Western and Central Alps, where many species appear to grow at a greater height than in the Eastern Alps.

In regard to the number of species of Flowering plants found within the Alpine zone, botanists' opinions again vary greatly, partly because they do not start on the same basis of altitude, and also because their ideas of what constitutes a species, or merely a variety, must necessarily vary. John Ball calculated that in the whole chain of the Alps 1117 species were found in the Alpine region, implying all above the limit of Coniferous forests, and they represented 279 genera and 60 families or natural orders. The number of species in the corresponding zone of the Swiss Alps may be estimated at about 900 out of a total of 2460 Swiss Flowering plants. Some 300 of these are confined entirely to the Alpine zone, while a great many are also lowland plants. The figures of Dr. Christ, of Basle, for the whole chain, were much smaller than Ball's, and he considered that 128 species of real "Alpines" are peculiar to the Eastern Alps, 86 to the Western, 75 to the Eastern and Western, while not more than 6 species occur in the Central but are absent from both Eastern and Western Alps.

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[1] The heights were taken approximately with the aid of a pocket aneroid.

In Switzerland alone Heer[1] found that, between 8580 and 9135 feet, 336 species occurred, 294 in Canton Grisons, 206 in the Valais, and 150 in Canton Berne. At about 10,200 feet he found 120 species in the whole of Switzerland; at 11,260 feet there were 13, and above 12,870 feet only 6 species occurred in Switzerland. These Swiss figures may be compared with those of Prof. Lino Vaccari[2] in the restricted district of the Aosta Valley, and my own figures[3] for the greater portion of the Western Alps, extending from the Maritime Alps to Savoy. Vaccari included Monte Rosa and the Grivola in his district, and he found 218 species and varieties above 2600 metres (8530 feet). In the greater area of the Western Alps I collected, during the one season of 1907, 351 species and 30 sub-species and varieties above 8000 feet or 2440 metres. Of these 217 were found between 8000 and 9000 feet, and 77 between 9000 and 10,000 feet. In each case, in Switzerland, in the Aosta district, and in the Western Alps of Piedmont, Dauphiny, and Savoy, although working on different plans, these three observers found at these heights a large number of plants of the subalpine region, and not a few of those belonging to the plains.

In an analysis made by Schroeter of the 73 species or varieties occurring at or above 3250 metres (10,725 feet) in Switzerland, he classed 40 as Alpine, 30 as High Alpine; 1 (*Thymus Serpyllum*) is a lowland plant and 2 are subalpine. The author has found several lowland plants at or above 9000 feet. They include *Lotus corniculatus*, *Thymus Serpyllum*, *Gentiana campestris*, and the grass *Nardus stricta*.

Rich as the Swiss flora is, Switzerland bears no comparison in the variety of its flora with either the Eastern or Western Alps. There are many districts in Tyrol, and again in Piedmont, Savoy, and Dauphiny, richer than any district in Switzerland. For example, from Mount Cenis and the valley of Susa no fewer than 2203 species of Phanerogams and Ferns have been recorded on the authority of Prof. Mattirolo,[1] while Schinz and Keller [2] give only 2534 species for the whole of Switzerland. In Switzerland itself most of the valleys south of the Rhone, such as the Visp Thal, Saas Thal, Val de Bagnes, and Val d'Anniviers, as well as the Engadine and the Cantons of Grisons, Tessin, and Valais generally, have many more species than the Bernese Oberland on the one hand, or the northern slopes of the Mont Blanc group on the other. This refers particularly to the granitic portions of those two districts. It is well known that a limestone formation is generally the most prolific, both in the mountains and in the lowlands. Indeed, a limestone soil is perhaps the richest in species in almost all countries where it exists.

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[1] Heer, O. "Die nivale Flora der Schweiz" in *Neue Denkschriften der Schweiz Nat. Gesell.*, Vol. XXIX (1885).

[2] Vaccari, L. *Flora Cacuminale della Valle d'Aosta* (Firenze, 1901).

[3] Thompson, H. S. "Liste des Phanérogames et Crypt. Vasc. recueillis au dessus de 2440 m. (8000 ft.)," etc., in *Bull. de l'Acad. de Géogr. Bot.* (1908).

Some attention has recently been paid, especially in Switzerland, to the particular flora of the limestone in comparison with that of the primary or crystalline rocks; and it has been observed that certain lime-loving species have a more or less closely allied counterpart in the granitic or in the siliceous rocks. This is not without importance in determining the species of certain critical genera, and particularly in that perplexing group of Gentians which are usually clubbed together by British botanists and gardeners under the Linnean name of *Gentiana acaulis*, but which includes *G. Clusii* Perr. et Song., *G. Kochiana* Perr. et Song. (*G. excisa* Presl.), *G. alpina* Vill., and *G. angustifolia* Vill.

The following table will show a few parallel types of Alpine plants, arranged according to whether they are lime-loving or lime-hating—that is, occupying the limeless slates and granites, etc.

LIME-LOVING	LIME-HATING
Anemone alpina.	A. sulphurea.
Ranunculus alpestris.	R. crenatus.
Hutchinsia alpina.	H. brevicaulis.
Doronicum scorpioides.	Arnica montana.
Rhododendron hirsutum.	R. ferrugineum.
Erica carnea.	Calluna vulgaris.
Gentiana Clusii.	G. Kochiana.
Primula auricula.	P. viscosa *Vill.*

A very interesting note on the partiality of certain plants to certain rock formations in nature, and their apparent indifference to what rock they grow on in cultivation, appears from the pen of Mr. Clarence Elliott in *Gardening Illustrated*, January 21st, 1911.

Warming has pointed out in his *Œcology of Plants* that species which replace each other on different soils are certainly derived from one parent species, and Kerner observed in parallel forms the following general distinctions. In what he called non-Calcicolous species (lime-haters) the leaves are generally grass-green and the hairs are glandular, while in Calcicolous plants the leaves are often bluish green, more divided and more deeply so, and the whole plant more strongly and densely covered with hairs, and often with a white or grey felt. If the leaves are entire in the lime-loving plants they are not uncommonly glandular serrate in the other group. Lastly, the limestone plants have sometimes a larger corolla and lighter hue than their cousins on the granite.

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[1] *La Flora Segusina*, Torino (1907).

[2] *Flora der Schweiz*, Ed. française par Wilczek et Schinz (1909).

To show how closely allied *Rhododendron hirsutum* is to *R. ferrugineum*, though the leaves are at sight so obviously different, yet when young *R. hirsutum* often has some of the resinous yellowish and finally rusty brown glands on the under side, which are so marked a feature of the other species, and gives it its specific name.

The fact that closely allied species have been shown to owe their peculiarities perhaps solely to the ground they live in, brings one to say how enormously many of the Alpine plants vary according, not only to soil, but situation, aspect, altitude, etc. This is a point which botanists are trying to impress upon nurserymen and gardeners, some of whom are far too ready to attach new names to forms of species which are not constant, and which, in some cases, such, e.g., as *Senecio Doronicum* and *Saxifraga Aizoon*, are well known to be most polymorphic in nature. This tendency, which may be partly due to a very natural trade rivalry, is not only to be lamented from a scientific point of view, but also because it increases the already far too large number of names and synonyms. It is not easy for every one to realize the difficulty involved in the comprehension of the extraordinary maze of names which have been given in the past by various botanists, even to the few hundred plants enumerated in this little work.

Although very often in these pages the most recent name, under what are known as the Vienna Rules of nomenclature, is given, for obvious reasons it has not been thought advisable to adhere to these rules entirely in a book of this character. Therefore, in some cases the best known, or the two best-known names, are given for species which may not necessarily be the earliest names.

CHAPTER II

ALPINE PLANTS IN THEIR NATIVE HAUNTS—SOME CHARACTERISTICS, ETC.

HAVING noticed that many species prefer limestone formations, and others are partial to the primary or to siliceous rocks, so also are some Alpines almost invariably found in certain types of locality, irrespective of soil. For instance, in moist, shady spots, more or less screened from the hot sun by trees or rocks, we find *Viola biflora*, *Saxifraga rotundifolia*, *S. cuneifolia*, *Hutchinsia alpina*, *Cortusa Matthioli*, *Cypripedium Calceolus*, etc. The meadows put up for hay are often blue with *Campanula rhomboidalis*, *Centaurea montana*, and *Phyteuma;* purple with *Geranium sylvaticum;* pink with Bistort and Lousewort, and yellow with *Tragopogon*, *Crepis*, and other Composites. The grassy pastures at a higher elevation, many of which are also mown later in the summer, are bedecked with innumerable and beautiful kinds of Orchids, Lilies, *Pedicularis*, *Anemone*, *Ranunculus*, *Gentiana*, and a host of other brilliant flowers, in which frequently the blues, reds, and purples are more conspicuous than in the woods, subalpine meadows or plains.

The rocks also have their distinctive flora, and are frequently clothed in garlands of Saxifraga or Sempervivum, of Primula, Globularia, and Dryas. The highest ridges and glacier moraines in their turn are sometimes bright with a flora which rarely, and in some cases never, descends to the level of the ordinary high pastures. It is to these exposed arêtes and cols and steep mountain sides that we have to go to see *Eritrichium nanum*, *Geum reptans*, *Androsace glacialis*, *A. helvetica*, and others of the genus, *Arabis cœrulea*, *Ranunculus glacialis*, *Saxifraga biflora*, *S. retusa* and *S. bryoides*, *Cerastium latifolium*, *Campanula cenisia*, and *Senecio incanus*. Many other Alpine plants are also found at these high elevations of from 9000 to 10,000 feet, and even 12,000 feet, above the sea, but most of them, like *Saxifraga oppositifolia* and *Erigeron alpinus*, descend to much lower regions, their seeds in some cases being carried down by glacier streams.

Why some of these highest Alpine plants, such as the typical dozen mentioned, should be found in the highest rocks and screes, and only there, I have never yet been able to discover, except that the climatic conditions are more or less unique. Nor do I know if any one has suggested any reason, except the very natural one, that in these celestial heights there is something in the air or in the soil which the plants cannot get a thousand metres, or sometimes only a thousand feet lower down. Possibly the extreme brilliance of the light at these high altitudes has the greatest influence, for the same rock and soil are found in lower places; and Bonnier has shown by experiment that high Alpine plants partially shaded show a tendency to develop lowland forms.

In order to accommodate themselves to the severe conditions of climate, and particularly to the shortness of the growing season at these heights, Alpine plants have developed certain devices. An obvious peculiarity of nearly all is their short stature, frequently only an inch or two high, with a rosette of leaves at the base, and a long underground stem or root, so that they cannot be easily blown away by the violent gusts of wind, which even in the summer are apt to come up so suddenly, as every mountaineer knows full well. The roots of such plants as *Cerastium latifolium*, *Campanula cenisia*, and *Thlaspi rotundifolium* frequently penetrate several feet into the gritty sand of a moraine, or the gravelly slope of some scree or bed of a glacier stream. These long, branching, fibrous roots also serve to catch all the moisture which slowly percolates through the shingle from the melting snow in spring and early summer, just when the plant is growing and needs all the moisture it can get.

The warm season is so short in these altitudes—June to the end of August, or sometimes mid-September—that the plants have to produce flowers and mature their seeds rapidly. The thick underground stems and roots, in which food is stored in winter, here also come into play, and the reserve stock of food is available directly the active season begins. The great majority of plants are incapable of any vegetative activity at a temperature below freezing point, such as it is during the greater part of the year at this elevation. Alpine plants are, however, protected from the greatest cold during the long winter by the deep covering of snow which is everywhere in the mountains.

It may be observed how extremely few are the annuals mentioned in this book descriptive of some 700 species, all of which are perennial unless otherwise stated. The scarcity of annuals in the Alps is obviously due to the shortness of the Alpine summer, for it is quite conceivable that an annual species might get exterminated in one or two particularly severe seasons, such as those of 1909 and 1910, by preventing the ripening of seed. Kerner states that only 4 per cent are annuals in the Alps, compared with 56 per cent in the Danube plains.

One of the greatest dangers to which Alpine plants are subject is the loss of water by too rapid transpiration, due to the physical conditions which obtain in these altitudes. To counteract this, we have already alluded to the absorption of water by the long underground stems. The same end is gained by the fact that many Alpine plants grow in tufts, mats, or cushions, with small, close-set leaves, as *Silene acaulis*, many Saxifrages and Androsaces, etc.; or their leaves may be arranged in flat rosettes pressed against the ground, as in the Pyrenean *Ramondia*, *Saxifraga stellaris*, several Drabas and one or two Gentians. A smaller leaf surface is thus exposed to the air, and it allows moisture to accumulate between the leaves. Hairiness in various forms and densities also tends to prevent the drying-up of many species, and particularly in such as Edelweiss, *Antennaira dioica*, *Hieracium villosum*, etc.

Finally, some plants, such as *Thlaspi rotundifolium* and *Arabis cœrulea*, have leaves leathery and covered with a more or less impermeable membrane, while others, like the succulent or fleshy Sempervivums and Sedums, have but a small surface exposed in comparison with the volume. The curious development of cobweb-hairs on the rosettes of *Sempervivum arachnoideum* also tends to keep them from getting dried up.

Although high Alpine plants are generally so small, they have a great abundance of blossom, e.g. many species of *Ranunculus*, *Potentilla*, *Geum*, *Gentiana*, *Primula*, etc. It often seems that the flowers are larger in proportion to the size of the plant than of those of allied species in the plains. Whether they are actually larger or not, the depth of colour is often greater.

In walking through an Alpine meadow or pasture one is struck by the number of pink or red, blue and purple or mauve flowers. The yellow and white flowers may be just as plentiful as in the lowlands, but the green of the plains is in the Alps often supplemented by the reds, blues, and purples. It happens that in many families the yellow flowers are the simplest and most lowly organised, and the blue flowers are the most complex. For example, in Ranunculaceæ, the yellow or white Buttercups are less complex than the blue Columbine, the deep blue Larkspur or dark violet Monkshood. In the Alps there is a greater percentage of the colours corresponding to high organisation than in the lowlands, that is to say that the reds, blues, and purples are more abundant in proportion than they are in the plains.

Some of these facts can be observed in a single walk from the lowlands up through the sub-alpine region and forest zone, and into the Alpine pastures or ‘alps’ beyond. The yellow Primrose is soon supplemented by various pink or violet species of Primula—the fact that there are a couple of yellow Primulas in the Alps does not upset the theory at all—the orange-red species of *Crepis*, *Hieracium* and *Leontodon*, and the orange-yellow *Arnica* take the place of paler yellow Composites in the plains; and in the great Saxifraga family we find high Alpine species with purple or red blossoms, such as *S. oppositifolia*, *S. retusa*, and *S. biflora*, in addition to numerous white and yellow species.

Not only are the herbaceous plants of the high mountains usually of low stature, and often nearly stemless, or in dense cushions covered with numerous blossoms, as *Cherleria sedoides*, *Eritrichium nanum*, *Silene exscapa*, etc., but most of the shrubs which reach the higher altitudes are creeping or prostrate, like several of the Willows, *Azalea procumbens*, and *Globularia cordifolia*.

These, then, are some of the characteristics of the plants which live in a zone where a prolonged winter is followed by a very short summer, where night frosts and violent winds alternate with brilliant sunshine or with rain and dew, and where the light and radiation are of an intensity unknown in the plains. It is for these peculiar climatic conditions that certain characteristics have been evolved to enable the complete development, blossoming, and ripening of seed in the short space of three or, at the most, four months.

When we remember how much of the exploration and conquest of the Alps has been done during the past fifty years, and that consequently so much has been learnt during this period about every feature of the great chain, we may not be so surprised as we otherwise should be if we turn to a little book such as that on *The Vegetation of Europe*, written by the late Arthur Henfrey, F.L.S., and published in 1852, and read what that author then said about the Alps, their geography and botany. However, some of the geographical or topographical statements are far more curious than any of his remarks on Alpine vegetation, which in the main are borne out by more recent investigation. This is only another proof of the fact that, at any rate in England, Botany was a more exact science in the first half of the nineteenth century than ever Geography was. Fortunately the time has arrived when Geography, and all that it implies, is given its due, not only in our schools, but our universities.

This brings one to make a brief allusion to the distribution of Alpine plants in other countries, but in regard to the vexed question of the origin of the Alpine flora the author does not propose to enter. Different theories have been advanced by different authorities, and students interested in the subject can refer to the writings of various botanists and naturalists, among whom may be mentioned Alphonse de Candolle, H. Christ, John Ball, J. D. Hooker, Asa Gray, Kerner, Schroeter, Briquet, Chodat, and Charles Darwin. The Demonstrator in Palæobotany at Cambridge, Mr. Newell Arber, has a concise chapter on the subject in his recently published book on *Plant Life in Alpine Switzerland*. Dr. Percy Groom has another in the excellent little *Introduction* to Ball's *Alpine Guide*, edited by Mr. Coolidge, and sold separately by Messrs. Longmans, Green, & Co., a little book which no traveller in the Alps should be without.

A comparison between the flora of the Alps of Central Europe and that of other mountain chains is a most interesting study. Many species are common to the Alps, Pyrenees, and Carpathians, and in the high Alps of Switzerland alone there is hardly a single flowering plant not found elsewhere. According to Schroeter, 275 *Swiss* Alpines occur in the Pyrenees, 399 in the Austrian Alps, 231 in the Carpathians, 129 in the Altai, and 72 in the Himalaya.

But to return to the Alps generally, there is a closer affinity between their flora and that of the Carpathians than between that of the Alps and Pyrenees. The Alps have about 180 endemic species, and at least 15 genera not found in the Pyrenees; and the Pyrenees have something like 100 species, but only 5 or 6 genera not found in the Alps. The beautiful *Ramondia pyrenaica* of our rockeries is one of these genera, but it occurs in Servia and Thessaly, as well as in the Pyrenees. The exquisite *Gentiana pyrenaica*, with fringed violet corolla, is an example of many species common to the Pyrenees, Carpathians, and Asia Minor, but wanting in the intermediate mountains. It must be remembered that in the Middle Tertiary period, and perhaps later, the Alps were separated from the Carpathians and from the Pyrenees by arms of the sea.

Ball pointed out that all the mountains possessing rich and varied floras, with many endemic species, are portions of ancient continental masses that have been isolated at various periods, but never totally submerged. This is true of the Pyrenees, Carpathians, the Balkans, the mountains of Greece and the Caucasus, while Spain and Asia Minor, possessing the richest mountain floras, were for long periods archipelagos, whereon the ancient flora was preserved, but subjected on separate islands to much specific modification.

Going further afield, it is curious to notice that, notwithstanding the vast extent of country that divides them, there is a very close affinity between the Alpine flora and that of the Altai, using this as a collective name for the ranges of Northern Asia. Fully one-fourth of the Alpine species and five-sixths of the genera are found in the Altai region. Yet in the much nearer Caucasus only about one-sixth of the Alpine species are known to occur. The Himalayas also show a number of the European plants, including the Edelweiss. Most of the Himalayan Gentians are, however, not found in the Alps. In the mountains of Japan also there are many species identical, or almost identical, with those of the Alps, and not a few which occur among the hills of Great Britain; for example, *Sedum roseum*, *Vaccinium Vitis-idæa*, *Linnæa borealis*, *Pinguicula vulgaris*, and *Carex montana*.

There are fewer Alpine plants present in the Arctic regions than in the mountains of Northern Asia, though some of them, such as *Saxifraga oppositifolia*, *Ranunculus glacialis*, and *Dryas octopetala*, are widely spread in the extreme north. About 17 per cent are common to the Alps and Arctic regions, while half the Arctic species occur in the Altai Mountains and nearly as many in the European Alps.

In the Rocky Mountains there are many plants typical of the Alps of Europe, though the flora generally of the United States of America is totally different from that of Western Europe. By way of example, we find in the Rockies such plants as *Caltha palustris*, *Dryas octopetala*, *Saxifraga oppositifolia*, *Primula farinosa*, and *Androsace Chamæjasme*.

CHAPTER III

THE CULTIVATION OF ALPINE PLANTS

THE number of persons in the British Isles who have taken up the serious cultivation of 'Alpines' of late years is not altogether surprising when one remembers how fascinating a recreation it is, and how comparatively easy and inexpensive. Nothing is more indicative of this still increasing fashion than the number of books which have been published on the subject of recent years, and the amount of space devoted to rock and hardy plants of all kinds in the horticultural journals.

Mr. William Robinson was about the first journalist and writer of books to set the fashion years ago, when the old firm of James Backhouse and Son were perhaps the only nurserymen of any standing who specialised in Alpines. Some ten years ago their then foreman, Mr. William A. Clark, brought out a very useful and practical little book, based upon his experience in the famous York Nurseries. Since then the writers of books and newspaper articles about rock-gardens have increased in numbers yearly, and although much useful and valuable matter has been published, particularly by Messrs. Reginald Farrer, L. B. Meredith, and others, there has also been some rubbish, especially in some of the daily and weekly newspapers, while one horticulturist has written a handsome book on the subject which shows clearly that unless one has long specialized in Alpines to write a book thereon is not an easy matter, even though he may give excellent advice on how to make rockeries properly.

So many writers have dealt with this subject of rockery building that there is no need to deal with the matter again here, and moreover, although valuable hints are certainly to be obtained by reading, yet an ounce of practice is worth a ton of theory in the making of rock-gardens. An intelligent person who uses common sense, and has developed his faculty of observation, will, if he has seen Alpine plants growing in their native haunts in the Alps or other mountains, make a better rockery than by reading all the literature on the subject. We are speaking of amateurs: the skilled professional designer of rock-gardens will naturally do better with the experience he has gained, for it is his profession.

The first thing to observe before attempting a rockery is the way in which rocks are super-imposed in nature, and much will depend upon their geological formation. In many hilly districts in our own islands such knowledge can be gained, and at the same time much can be learned in regard to the habitats of the plants to be cultivated, and how they adapt themselves to the various local circumstances; how some seek the shade, or the damp places at the base of a cliff, while others prefer the blazing sun and the hottest of limestone crags; how some send their roots deep down into crevices between rocks, from which they can hardly be removed, while others, like some of the Saxifrages and Sempervivums, are satisfied with the thinnest layer of humus on the barest of rocks, a bed which has gradually been made, perhaps by decaying pine-needles which have fallen on some depression on a boulder or some narrow niche in a cliff. Again, some Alpine plants will only grow on screes of loose stones or other debris, or on glacier moraines, and therefore an attempt at a miniature moraine of sand and shingle should be made for them in the garden.

The peculiar denizens of the Alpine forests should be planted in the shrubby parts of the rock-garden, or some, such as Pyrolas, *Achillea macrophylla*, *Mulgedium alpinum*, *Cortusa Matthioli*, *Ajuga pyramidalis*, and *Linnæa borealis*, will thrive under the partial shade of trees. Several of the Orchids, the Pinguiculas, some Primulas, and other moisture-loving subjects, will do best in peaty soil at the foot of the lower rocks, or in a bog-garden specially prepared for them.

One of the chief things to secure in a rockery is thorough drainage of the subsoil, and this can best be obtained by digging away the soil a foot or two deep before any stones are laid, and placing a good layer of broken stones, etc., of various shapes and sizes before the soil is replaced.

Thorough drainage is of the utmost importance, and it is frequently for the want of it that Alpines in this country die off in the winter, particularly on heavy soils. In the Alps the plants mostly grow in places that are naturally drained, and where water does not stagnate; and yet in the growing season the roots of many are furnished with a copious supply of water from the ever-melting snow above, which sinks into the porous soil and replenishes the thirsty roots which may lie hidden a yard beneath the surface. This fact must never be forgotten in England when the plants are making progress, and the hot sun or cold east winds tend to dry up many tender things. On the other hand, in winter most of them cannot be kept too dry, for in nature in the high mountains the ground is frost-bound for eight or nine months of the year and covered with deep snow. It is therefore better to protect certain delicate kinds from excessive rainfall or continual drip, by placing a piece of glass or slab of stone in a horizontal position above them, though this is often not easy to carry out in practice.

A point often disregarded in making rockeries is the fact that in nature some of the best specimens grow where the strata slopes inwards. This inward slope allows for the penetration of moisture to a depth sufficient to keep the plants from being dried up in the hottest summer weather.

Although so many plants in cultivation are killed from want of proper drainage and from exposure to our damp and comparatively sunless winter, yet perhaps almost as many are failures or partial failures from the mere fact that the soil around the base of their stems or rosettes of leaves has been allowed to become clogged and foul, and often coated with liverwort, moss, or some other cryptogamic plant. In other words, the importance of top-dressing with grit, sandy loam, leaf-mould, or small pieces of limestone, according to the likings of the plant, cannot be too frequently remarked. This particularly applies to plants in pots or boxes in cold frames or greenhouses, and we have at times seen hundreds of young plants in nurseries which have been killed simply because the top layer has not been raised, and some fresh dressing given to take the place of the green slime or growth of moss or liverwort.

In rock-gardens some of the most successful growers are in the habit of taking up and rebuilding the rock-work every four or five years, renewing a portion each year. This has the double advantage of improving the soil, and at the same time it gives an opportunity for renovating some of the plants which have become feeble or partly dead, and for thinning-out others which have tended to be straggling or too rank. Some plants are better for being removed or transplanted more frequently than others, but all the shrubby kinds, and those with long deep roots, are better not shifted at all, but merely kept within bounds.

Those who are accustomed to the sight of Alpine and rock plants growing in the mountains, and know their dwarf stature, compact habit, and brilliant colour, cannot fail to be struck by the unnatural and drawn appearance of some that are grown at home, and even sometimes exhibited at shows. This is often due to their being kept too long in covered frames and damp greenhouses, instead of being as soon as possible placed in the open air, where they become more hardy and their growth is retarded or kept within reasonable limits. Such common plants as *Primula farinosa* and *Lychnis alpina*, for example, are sometimes seen with thin, drawn stems nine or ten inches high, bearing a feeble head of pale pink flowers, and thin, green foliage, which are sorry objects indeed when compared with a specimen fresh from the Yorkshire moors or the fells of Cumberland.

There are some choice and yet common rock plants, such as *Anemone Pulsatilla*, which are better never indoors, for there is something in a greenhouse which tends to make them 'go to leaf,' just as many do when grown in the shade: they lose their character.

It has been stated in the previous chapter that the recent experiments of Bonnier have proved what enormous influence light has upon the high Alpines, since plants partially shaded are apt to produce lowland forms. The forced and 'coddled' state of a few of the Alpines sometimes exhibited at shows is doubtless partly accounted for by the fact that growers frequently keep and bring on their exhibition plants in a greenhouse in order to keep them clean and well under their control in readiness for the next show. But forced Alpines are like forced strawberries or early green peas—they have not the concentration of quality of those grown naturally in the open.

A great many kinds of rock and Alpine plants are better grown from seed than from established plants. Much of the stuff sent to England by collectors is wasted after a week or two, if it does not die on the journey itself, for want of sufficient root. This applies particularly to some of the Anemones and species of Adonis. It is so tedious to get up an unbroken root of such a plant as *Anemone alpina* or *A. sulphurea*, with their long, fibrous tap-roots, that few of the imported specimens survive. Moreover, as Alpine gardens are increasing so rapidly in these islands, the more seed is used instead of rooted specimens the better for the appearance of the flower-bedecked mountain pastures.

But if owners of rock-gardens want to collect specimens for themselves, it is better for several reasons not to go to Switzerland for them, but to other Alpine countries less frequented by visitors, where collecting regulations are either less severe or altogether wanting, and where there is a richer and more varied flora than in Switzerland itself. There are many delightful districts, east, south, and west of Switzerland, where all these conditions may be found in greater or less degree.

In a large Alpine garden it is very interesting to arrange some of the plants in genera; for instance, one rockery may be devoted to Saxifrages, another to Primulas, a third to Pinks, and so on. Or the groups may be arranged on a geographical basis, though this is hardly ever done except in a few of the newest and most instructive public Alpine gardens such as that at Geneva, and the beautifully situated Jardin de la Linnæa at Bourg St. Pierre on the Great St. Bernard road in Valais. In most private gardens it would be better to make groups of plants which are more or less of the same size and of similar wants than to classify them either geographically or botanically.

Those which prefer shade should be placed on the north side of the rockery, so as to be protected from the sun; creeping plants and those forming carpets, such as *Saponaria ocymoides*, *Gypsophila repens*, *Dryas octopetala*, *Globularia nudicaulis*, *Geum montanum*, *Geum reptans*, *Cerastium montanum*, and many others which have a tendency to spread quickly, should be placed either in the lower and larger beds, or near some of the rocks which want covering. Plants which naturally grow on sunny rocks, like many species of *Saxifraga*, *Sempervivum*, and *Potentilla*, may be established in the interstices of the upper rocks facing south, or upon old walls, and the larger and more shrubby things, like Rhododendrons, Daphnes, *Pinus Pumilio*, and *Betula nana*, together with Globe flowers, Hellebores, Aconitums, large Campanulas, etc., may be distributed over the structure in such a manner that each group may have a pleasing and natural appearance. Some of the smallest and choicest gems, including the Androsaces, the smaller Primulas and Gentians are best planted alone or in groups near together, but well away from any strong-growing subjects that may smother them.

The grouping of certain kinds of Alpines according to colour, habit, and natural wants is one of the most interesting features of the Alpine garden. As in most things, it is often best to follow nature here. *Dryas octopetala* will look charming with the bright blue flowers of *Gentiana verna* appearing through its mass of glossy leaves and star-shaped blossoms; *Globularia cordifolia* can be planted on the same rocks with several of the Sempervivums; *Saxifraga Aizoon* with *Saponaria ocymoides*, *Primula farinosa* in a damp spot with *Gentiana bavarica*, and any wet rocks can be decorated with a combination of *Primula integrifolia* and *Ranunculus alpestris*, and so on.

It used to be said that Alpine plants flourished on the poorest of stony soils, but this does not apply to many, and, on the contrary, a large number rejoice in a deep, rich soil almost black with humus or decayed vegetable matter. If one examines the ledges of rock where many of the finest flowers are seen growing wild, it will be found that they are often situated at the top of a piece of vertical rock immediately below and underneath a more or less overhanging edge of turf, or other mass of rich soil or peat. Primulas such as *P. viscosa* Vill., *P. Auricula*, and the much scarcer *P. latifolia* Lap., with its deep violet flowers, grow best in some such place, and their deep roots are found to penetrate long distances into the dark, rich soil, between the rock and ledge of turf, or some peaty growth above. I fully agree with Mr. Farrer when he says *Primula latifolia* (*P. viscosa* All., not Vill.) is far too scarce in cultivation. It is found in Eastern Switzerland, and in some of the French Alps and Pyrenees.

Many plants have been found to be all the better for a liberal supply of good fibrous loam, sometimes mixed with leaf-mould or peat, and sometimes with lime refuse, or with bits of sandstone or grit. Provided the soil is deep and porous it cannot well be too rich in humus to suit most of the beautiful plants of the mountain meadows and pastures. Manuring of the soil is, however, not recommended. Numerous small stones and pebbles can be both dug into the soil a foot or so below the surface and also left on the top. These pieces of stone tend to keep the roots cool in summer, and to lessen the dryness of the surface soil in hot weather.

When Alpines are once established, their subsequent treatment does not present much difficulty. In the summer, when hot, it is often necessary to water them in the early morning and evening. Weeds should be destroyed, and the beds kept as clean as possible, not only from ordinary weeds, but from still more hurtful growths of *Marchantia* and *Lunularia*, which appear out of doors in damp places hardly less than on pots or boxes in houses. Slugs should be collected and killed whenever seen.

Alpine plants are propagated by seed, by cuttings, by division of the rootstock, or by layers. The division and transplanting is best done either in the spring, before growth begins, or in the autumn, after it is completed. Most rock and Alpine plants can be easily increased by division, and particularly the Saxifrages, Primulas, and Androsaces.

Many kinds which have runners, such as *Linnæa borealis* and *Geum reptans*, can be increased by merely detaching separate pieces and replanting them firmly in shaded beds, or the more delicate ones in pots. Several of the dwarf Campanulas with a creeping rootstock or rhizome can be treated in the same way. Some of the hard-wooded plants, such as Azalea, and some of the Daphnes and Rhododendrons, which do not produce seed in this country, and are difficult to strike from cuttings, can be increased by layering. This is done by selecting a suitable branch near the ground and cutting it half through near a joint and then pegging it down firmly and covering it with a compost of loam and sand an inch or two deep. If roots have been formed by the following spring, the layered portion can then be cut from the parent plant.

To propagate by cuttings, a method particularly applicable to shrubs, and some of the hard-wooded plants, such as *Arctostaphylos*, *Helianthemum*, *Cistus*, *Daphne Blagyana*, *Juniperus nana*, *Rhamnus alpina*, *R. pumila*, *Artemisia Mutellina*, etc., half-ripe branches should be cut off in autumn and placed in a shallow pan or bed. The cuttings should not be more than three or four inches long, and the lower leaves should be trimmed off, and the shoots must be cut immediately below a joint from which the roots will spring. The pans or pots should have good drainage, and a compost of fine loam and sharp sand is best, which can be made more porous by adding pieces of charcoal if desired. Each cutting should be firmly placed in little holes about one and a half inches deep, which are drilled with a stick or ordinary lead pencil, and it is better to drop a pinch of silver sand in each hole. It is most important that the cuttings should be firmly rammed down. They can then be placed in a cool frame, or in a shady place covered with bell-glasses, screened from the direct sun and daily allowed fresh air. They should be kept at a uniform moisture, but any excessive moisture will soon make the cuttings damp off. When the young shoots have grown to some size and become firmly rooted they should be gradually accustomed to the open air until ready to be transplanted. Among the plants which can be grown from cuttings in a prepared bed in the open are many species of *Helianthemum* and *Cistus*, but such a bed should be in some sheltered corner or under a wall.

Most Alpine plants can be grown from seed, either in the open border or preferably in pots or wooden boxes. The sooner the seed is sown after it has matured the better, and in saying this we are only following Nature. The seeds of the perennials, and they form the great majority, can be sown thinly in April or May or, indeed, at any time from April to August, and if seed is collected in the summer months it is better sown at once than kept to the following spring.

Although many Alpines can be sown in a suitably prepared bed in a sheltered position out of doors, some of the rarest and best seeds should be sown in pots or boxes in the following manner. The pots should be well drained and filled either with a mixture of sifted loam and sand or with sifted sandy heath soil. The subsequent growth of Liverwort (*Marchantia*) and weeds of a like nature is the cause of much trouble. The best preventative is to either bake the soil or to soak it in the prepared pots with absolutely boiling water, which will destroy the seeds and spores of weeds and kill all insects at the same time. After the boiling water is used the pots must be left for a day or two before sowing the seed. The seeds should be sown on a firm level surface and have a very light and shallow covering, and some of the very small ones might be lightly covered only with triturated moss. The pots or boxes should then be gently watered with an extremely fine rose, placed in a frame or cool greenhouse, well shaded, and kept at a uniform moisture. As soon as the seedlings appear, they should be gradually hardened and exposed to the air, but not allowed to grow too lengthy, or nothing can be done with them. It is astonishing how rapidly some seedlings become too tall to be manageable in this delicate stage if proper care be not exercised. A few hours' sun might draw them up to such an extent that they cannot be watered without being beaten down like a field of mowing grass is after a heavy storm, which would make the subsequent operation of pricking out into larger pots or boxes one of great difficulty. This pricking out is a tedious business. The young seedlings are put in rows an inch or two apart, according to their size, kept again at a fairly uniform moisture, and more or less shaded from the hot sun, until large enough to be planted in the open, or, more usually, they are planted singly or a few together in small pots, and placed in a frame and kept rather moist. In the winter they may be more freely exposed to the air and kept dry and clean. When the weather permits, in spring, they can be transplanted into the open and treated like the old plants. If Liverwort appears during any of these stages, it or other weeds must be removed with the greatest care, so that the young seedlings are not disturbed.

It is too often thought that the possession of a large garden is necessary to grow Alpine plants. As a matter of fact there is nothing whatever to prevent excellent and pleasing results in a garden of the most modest proportions. But whatever be the size of the garden, suitable stone must be obtained, for rockeries cannot be made out of brickbats and clinkers.

CHAPTER IV

ON COLLECTING AND PRESSING ALPINE FLOWERS

THE author has so often been asked, both at home and abroad, how best to dry plants for the herbarium, that a few hints thereon may be useful to some readers. Although the method is simple enough, it is surprising in these days, when much so-called "Nature Study" is being taught at schools, that frequently the teachers themselves are ignorant of how to instruct their pupils in the making of a collection of wild flowers.

The methods adopted in England largely apply to Switzerland, or any other country. Specimens are usually collected in a large japanned tin, sometimes called a vasculum; but some botanists prefer to take into the field a light portfolio, furnished with leather straps and sheets of drying paper, so that the plants, and especially the more delicate ones, can be put straight into paper, and only sorted and rearranged on returning to the house. In wet or windy weather such a contrivance is useless.

Most of the tins carried by young botanists are bought ready-made, and are too short. The tin should be, for ordinary purposes, about fifteen inches long and eight inches wide, with rounded edges, and the opening, which is on the broadside, should be large enough to admit average specimens without difficulty or needless doubling. The cover to the opening is attached by a couple of hinges, and it fastens at the side. The plant-tin is most conveniently carried from the shoulders by a leather strap. It is often an advantage, and especially in the mountains, to have a smaller tin, such as is sometimes called a sandwich-tin, which will go within the coat pocket. The smallest or more delicate plants can be placed in this tin, or small wet roots which might damage loose flowers in the larger box.

A perfect specimen should have root, stem, leaves, flowers, and fruit—both young and mature if possible. If, as is often the case, the fruit cannot be obtained on the same plant with the flowers, it should be gathered separately from another. It is most important to get the fruit, and in a more or less developed state, for in some families, such as *Cruciferæ*, *Leguminosæ*, and *Umbelliferæ*, it is at times impossible to correctly determine a plant without. Good typical specimens should be selected, not necessarily the largest, but the most perfect and convenient in size.

The sheets of paper upon which the specimens are finally mounted should not be less than about 15 × 10½ inches, which is the size most cartridge paper cuts into, but 16½ × 10½ is still better, and this is about the size adopted in the Kew Herbarium, and quite large enough for ordinary purposes, though exceeded in several of the other great public herbaria.

When plants are not more than about fifteen inches tall it is better to put them into the tin and the press whole—not cut or doubled. When, however, a tall plant or shrub is dealt with, a good flowering branch should be cut off with several of the lower stem leaves, and the root leaves, if any, should be added separately, so as to give the complete habit as much as possible.

Now as to a press. At home this is very simply made from two stout boards, about 16½ × 10½ inches, clamped together, and either furnished with strong leather straps—screws are not advisable—or the pressure can be got from the weight of hard bricks or other heavy articles placed on the top. Such automatic pressure is perhaps the best, for it adjusts itself to the diminishing thickness of the contents as the plants dry. To separate half-dried plants from fresh ones, and to keep the whole mass level, and generally hasten the drying, the writer has found a few thin wooden 'ventilators' or frames the size of the press, made of cross-pieces of wood half an inch wide and one-eighth inch thick, very useful.

Such a press as this can be taken to the Continent without much trouble; but if a less extensive collection is anticipated, it would be better to take a couple of thick pieces of mill-board with leather straps or thinner straps made of a kind of braid with buckles attached. Sometimes strong wirework frames or lattices can be bought, which answer the same purpose, and they are not heavy. These wirework lattices, being the size of the press, could also be used in place of the suggested wooden ventilators.

Common blotting-paper should never be used for drying plants in; it is too tender, it does not last, costs too much, and the plants often stick to it. Any coarse, stout, and unsized paper will do, and even old newspapers are better than nothing. It is not necessary to buy the specially made grey, bibulous paper, though as it lasts a lifetime it is not expensive in the end.

Before the specimens are placed in the press they should be examined, and any superfluous branches, leaves, or buds removed, if a fairly flat object cannot be otherwise attained. Roots should have soil or sand shaken from them, and they should be washed if necessary, and dried in a duster. The plant is then laid out as naturally as possible on a sheet of drying paper, and others are placed by it until the sheet is fairly covered. Several sheets of paper should be placed between this lot and the next, according to the nature of the plants and the thickness of the paper; but the great idea in drying plants is to dry them *quickly*, and thus preserve the colour as naturally as possible. The more paper used and the oftener it is changed and dried the better. At first the papers should be dried every day, in the sun or by the fire; afterwards less often. If the paper is hot, all the better, and a hot iron is often a useful adjunct. The pressure should be light at first, and increased after the first day, but the flowers and delicate leaves of some plants will shrivel if the pressure is not even and adequate. However, many a youthful collector is apt to forget that *drying* is the chief thing, and that the pressure can easily be overdone. At the first changing of papers the specimens can be rearranged while pliable, and superabundant parts removed with scissors. When quite fresh many specimens do not so easily yield to necessary treatment as now.

Generally it is better to leave plants in the tin, rather than put them in water, if it is inconvenient to press them within one or two days, while many small kinds would remain fresh a week in the tin if in a cool place, though both leaves and flowers might lose some colour during that time. Most of the very thick or fleshy portions of plants, such as the head of a thistle, the bulb of a Daffodil, or the stem of an Orobanche, should be cut in two before being dried. In fact, the whole of a thick Orobanche or of a plant like *Campanula thyrsoidea* had better be split in two from top to bottom. Usually both halves are worth preserving. Woody stems also are better split in two, or at any rate thinned.

Succulent plants, such as Orchids, Sedums, and Sempervivums, are best dipped in *boiling* water up to the base of the flowers. This kills the plant at once, and enables it to be dried more quickly, and with much less loss of colour. Thick Orchids should always be killed in this way, and their tubers and stems might first be pricked with the point of a knife to hasten the process of scalding, for the final result, particularly in regard to the green colour of the leaves, makes it well worth the trouble. Dipping in boiling water is also recommended in the case of Heaths, which shed their leaves while being dried.

It is well to write on a rough, temporary label the name of the plant, if known, the place where it came from, date, and approximate altitude. It is interesting sometimes to add the kind of soil or geological formation. These labels should be placed with the specimens they refer to, and afterwards copied when the plants are mounted. If a series of one species or variety, especially when belonging to a critical genus, be collected, every example should have a little label or ticket with the same number, while one label only need have the full particulars.

When the specimens are quite dry and stiff they can be packed close together, with only a single sheet of paper between each layer, and this paper need not be bibulous, but if it is unglazed the specimens will keep in position better when travelling, and not slip about so readily if the parcel is not quite tight.

It has been customary in this country to mount dried plants on paper by means of paste, good gum, or liquid glue. When frequently handled this may have its advantages, and especially if little envelopes containing loose portions of the flower and fruit are attached for careful examination or dissection ; but many amateur botanists attach their specimens to the paper with narrow strips of gummed paper, so that they can be examined on both sides, and altogether removed if desired. The little rolls of transparent adhesive paper sold by stationers for repairing torn music, books, etc., cannot be improved upon for this purpose. Another method sometimes adopted on the Continent is to attach the thin portions of stem, etc., to the paper by means of ordinary pins, of course placed horizontally.

Collecting and drying plants in the Alps is a very different thing from what it is in certain 'new' and uncivilised countries. In some of the excellent Swiss hotels the work is done as easily as in one's own home. The papers can easily be dried in the hot sun on the balcony of one's room, or on the paved terrace which is such a feature of many hotels.

The novice is, however, cautioned not to buy the usual bright green, cylindrical plant-tin offered him in the Swiss shops ; and, if he wants a specimen of Swiss wood-carving, not to get it on a 'plant press,' 6 × 8 inches in size, whose straps may not last a week, and whose paper is not much thicker than newspaper, though generally the orthodox grey colour. He had far better ask the *Papetier* for some of his ordinary rough wrapping paper ; or, if in France or Italy, he would find the tough, yellow paper so frequently used in grocers' shops an excellent and lasting drying-paper.

Finally, let all collectors of Alpine plants, of whatever nationality, be careful not to take more specimens than they actually require, though the temptation may sometimes be hard to resist.

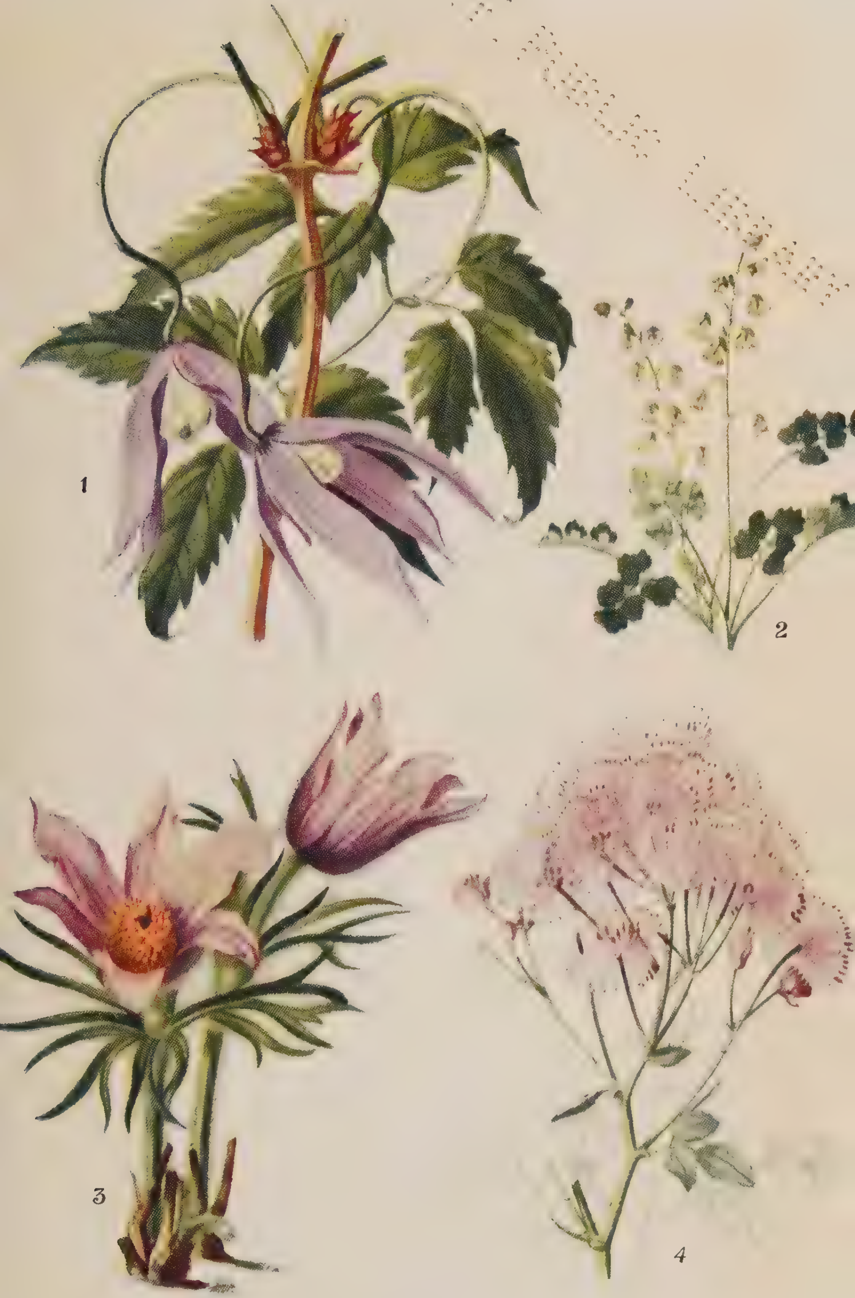

PLATE I.

1. Atragene alpina L.
2. Thalictrum alpinum L.
3. Anemone Halleri. All.
4. Thalictrum aquilegifolium L.

PART II

CLASS I. DICOTYLEDONS

RANUNCULACEÆ

HERBS with alternate or radical leaves, or in *Clematis*, climbers with opposite leaves. Leaves often cut and flowers solitary or in terminal racemes. Sepals distinct, usually 5. Petals distinct, usually 5, but sometimes deformed, or very minute, or altogether wanting. Stamens numerous, inserted on the receptacle. Carpels several, distinct or partially united, each bearing a distinct style and enclosing a single cell with one or more ovules or seeds attached to the base or inner angle of the cavity. Many possess acrid or poisonous properties, and several are used in medicine. A family widely spread over the globe, but especially in temperate or cool climates, and comprising about 700 species. In the tropics almost entirely confined to high mountain ranges.

CLEMATIS L.

Stem usually climbing and often woody at the base. Leaves opposite. Sepals 4 or 5, valvate in the bud, coloured and petal-like. No real petals. Stamens numerous. Carpels numerous, 1-seeded. Widely spread over the globe, and almost the only representative of the family in tropical climates.

Clematis alpina Mill. (*Atragene alpina* L.). (Plate I.)

Shrubby. Stem branched, woody, spreading, decumbent or climbing, swollen at the joints, scaly, leafy, and provided with 3-branched dry tendrils (the dead leaf-stalks of the previous year). Leaves opposite, stalked, usually doubly ternate and slightly hairy; segments ovate-lanceolate, acuminate, unequally serrate, often lobed or connate at the base. Flowers large and solitary, violet, on long stalks, axillary, dependent. Petals small, erect, spathulate. Sepals lanceolate, erect or patent. Seed-vessel terminating in a long beard, by which it is disseminated by the wind.

Stony places in the Alps, also in woody, subalpine districts, often covering rocks and shrubs with beautiful garlands. 2500–7000 feet, and up to 7750 feet in Dauphiny. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; rare in Switzerland (Grisons), Transylvania, Lapland, Northern Asia, and North America.

A showy creeper for clothing masses of rock or ugly banks in the garden.

THALICTRUM L.

Herbs with a short, perennial rootstock and much-divided leaf-stalks, bearing distinct segments or leaflets. Sepals 4 or 5, small, coloured, and petal-like, but no real petals. Stamens numerous, with long anthers projecting beyond the calyx. Carpels several, 1-seeded, furrowed. A genus of about 70 species, diffused over the northern hemisphere, variable and difficult to characterise.

Thalictrum aquilegifolium L. (Plate I.)

Rootstock cylindrical, knotted, oblique, with stout fibres or tufts. Stem sometimes a yard high, robust, glabrous, finely furrowed. Leaves roundly triangular, 2 to 4 times pinnate, with membranous stipellæ at the branches of the leaf-stalk, light green above, bluish green below, auricles of leaf-sheaths blunt; leaflets roundish, obovate or wedge-shaped, often oblique or cordate at the base, obtuse, crenate, 3-lobed or undivided. Flowers erect, in dense terminal cymes. Stamens erect. Carpels 3-edged, winged, stalked, pendent. Sepals and stamens various shades of lilac; anthers yellowish.

Rich upland meadows of the lower Alps, descending far into the plains, in meadows or margins of woods, etc., often in stony places by glaciers up to 6000 feet, and growing with Rhododendron, as shown in the picture on page 104 of Flemwell's *Alpine Flowers and Gardens*. May to August. It is a useful border plant, and can also be placed in the bushier parts of the rock-garden.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Black Forest, Vosges, Jura, and almost the whole of mountainous Europe; Northern Asia.

Thalictrum minus L.

Stem often a yard high, flexuous, furrowed, glaucous, glabrous or pubescent-glandular. Leaves large, with leaflets glaucous below and usually large. Flowers yellow, pendent, in branched, leafy panicles; flower-stalks slender. Carpels oval, with longitudinal ribs.

A very polymorphic plant, growing in hills, rocky places, chestnut groves and fields, especially in subalpine districts. June to July. It is worth cultivating for its beautiful foliage, resembling robust and wiry Maidenhair Fern.

Distribution.—Europe, Asia, Africa, North America (British).

Thalictrum alpinum L. (Plate I.)

Root slender, creeping. Stem 2–4 inches high, almost naked, simple. Leaves radical, doubly pinnate, glabrous; leaflets obovate, ternate, crenate. Flowers in a simple terminal raceme, greenish yellow, pendent; flower-stalks recurved. The smallest of the genus.

Moist Alpine pastures; rare; 6000–8000 feet. June to August.

Distribution.—Eastern, Central, and Western Alps; in Switzerland only in Grisons; Eastern and Central Pyrenees; Northern Europe and Asia, Caucasus (British).

Thalictrum fœtidum L.

Rhizome short. Stem 4–12 inches high, flexuous, feebly striated, glandular pubescent, and fœtid, like the whole plant. Leaves as broad as long, somewhat triangular; leaflets small, toothed, usually densely pubescent, rarely glabrous. Foliage resembling Maiden-hair fern, except in colour. Flowers yellow, pendent in a much-branched panicle. Carpels rounded at the base, oval-orbicular, with prominent ribs. A somewhat polymorphic plant, found in rocky places among the mountains up to 8000 feet. June to August.

Distribution.—Alps of Central Europe; Eastern Pyrenees; Central and Northern Asia.

The nomenclature of the European species is a little involved, so that a monograph of the genus would be useful. The European kinds are easily naturalised in Britain in almost any soil, and readily increased from seed or division in early spring. *T. aquilegifolium* is particularly ornamental in gardens, and likes shade and a light soil.

ANEMONE L.

Rootstock perennial. Leaves radical. Involucral bracts compound and often leaf-like. Flowers usually solitary. No petals. Sepals 5 or more, coloured and petal-like, longer than the stamens, which are numerous. Carpels numerous, 1-seeded, often ending in a long feathery awn.

A large genus of some 85 species, found in most of the temperate regions of the world, and chiefly characterised by the three 'leaves' placed in a whorl from half-way up the stem to very near the flowers, according to the species.

Anemone Hepatica L. (*Hepatica triloba* Chaix.).

Root short, fibrous. Stem naked, velvety. Leaves leathery, heart-shaped at the base, with 3 entire equal lobes, often purplish below, persistent and with long petioles. Flowers blue, rose, or white, solitary. Involucre of 3 oval, entire leaflets, resembling a calyx. Sepals 6–9, glabrous. Carpels covered with tomentum, with short, glabrous beak.

The blue form is the commonest, and it is abundant in shady places and woods among the hills, especially on limestone. March to June.

Distribution.—Nearly all Europe, Siberia, North America.

The author has seen *A. Hepatica* in limestone thickets behind Toulon on the Mediterranean, and as high as 7000 feet on the Zermatt side of the Matterhorn. As is often the case with plants of wide range of altitude, *Hepatica* blossoms as early in subalpine valleys in Switzerland, where in spring it is a lovely object, as in the hotter districts in the south, such as the foothills of the Pyrenees and the low, wooded hills of the Var.

In gardens it should be disturbed as little as possible. It likes a deep, light soil, with some leaf-mould.

Anemone narcissiflora L. (Plate II.)

Rootstock oblique, premorse, with branching fibres. Stem erect, 4–12 inches high, simple, with several leaves at the base, villous, like the leaves, and bearing a terminal 3–6 flowered umbel, rarely 1-flowered by abortion. Root-leaves stalked, palmate, 3–5 partite, sparsely villous or glabrous on the upper side; the segments usually doubly 3-cleft. Bracts 3–4, sessile, more or less resembling the root-leaves, but smaller, less divided, and often only 2–3 cleft. Sepals usually 5, glabrous on both sides. Flowers white or pale rose-coloured, ¾ to 1½ inch in diameter; seed-vessel erect; carpels not bearded, very shortly beaked.

Alpine pastures and occasionally, as at Engelberg in Switzerland, on steep, wooded banks, but nearly always on the calcareous Alps, from 3000 to 6000 feet, and often covering large tracts. End of May to August.

Distribution.—Erzgebirge; Eastern, Central, and Western Alps; Vosges, Jura, Pyrenees; Caucasus, Western and Central Asia; North America.

This beautiful Anemone likes rich, loamy soil, with plenty of leaf-mould mixed with lime. As with other members of the genus, care should be taken to get up the whole root with plenty of fibre if success is expected from collected specimens.

Anemone palmata L.

Root tuberous, brown. Stem 4–8 inches high, downy, bearing a single flower. Leaves leathery, radical, palmate, suborbicular, with 3–5 obtuse lobes, often purplish below. Bracts of the involucre sessile, with 3–5 lanceolate-linear divisions. Flowers bright yellow, solitary; sepals 8–12, oblong, obtuse; carpels woolly, oval-oblong, with glabrous beak. The flowers resemble those of a fine Lesser Celandine in both size and colour, but they are not shiny. Indeed, we have seen this rare plant in the Department of the Var growing by the roadside, just as the Celandine does in England, but it does not like moisture. It prefers dry woods, whence, owing to the wicked rapaciousness of a collector for the English market, it was almost exterminated a few years ago in the Var. It flowers in April.

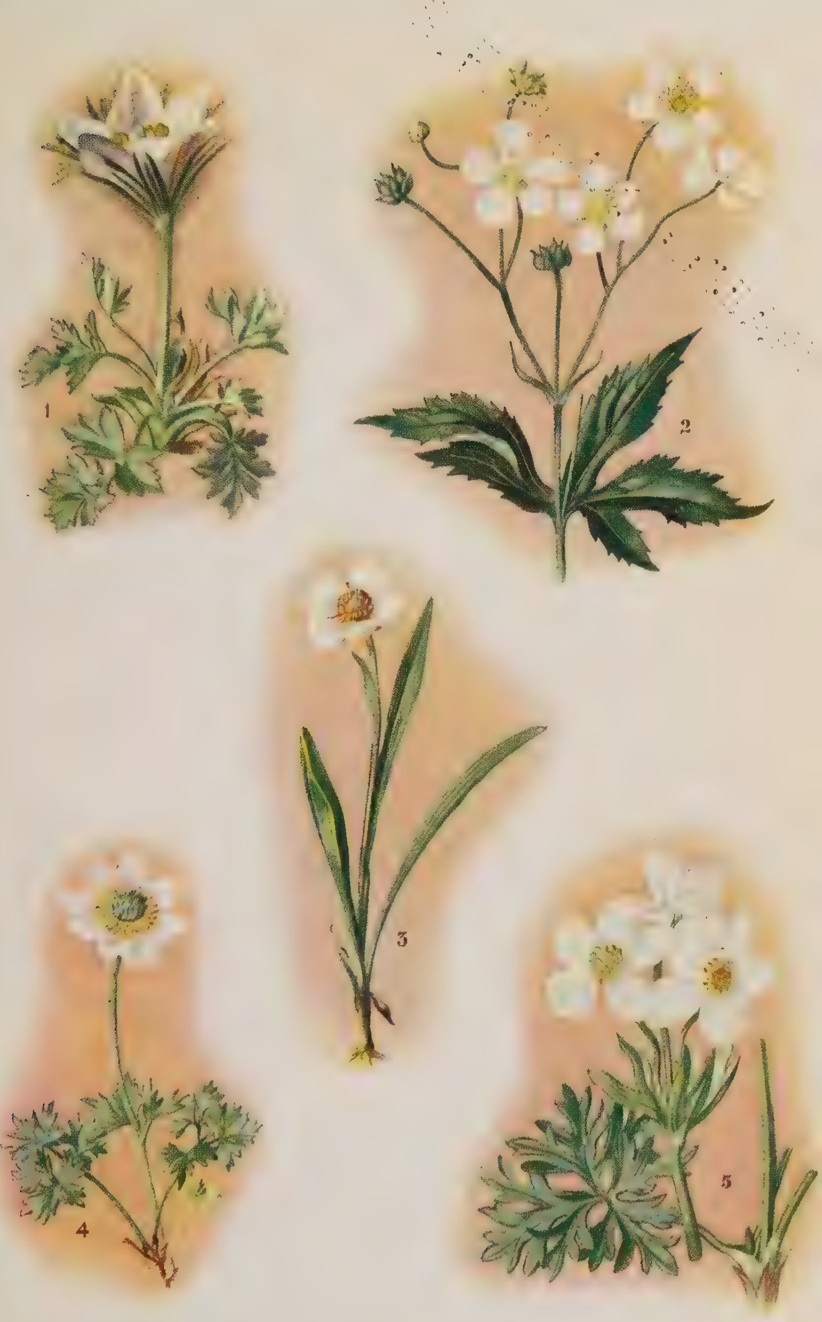

PLATE II.

1. Anemone vernalis L.
2. Ranunculus aconitifolius L.
3. Ranunculus pyrenæus L.
4. Anemone baldensis L.
5. Anemone narcissiflora L.

Distribution.—The Var and the Bouches-du-Rhône; Spain and Portugal, Sicily, Sardinia; Algeria and Morocco.

Though not an Alpine plant, this very distinct species, like the variety *alba*, is well suited to dry, sunny places in the rock garden, where it can root deeply in fibrous loam or leaf-mould; and being obtainable from several nurserymen it is worthy of a place here, especially as there are very few yellow Anemones. If raised from seed the young plants in pots should not remain too long in the frame or greenhouse, for the moist atmosphere draws out the stem and the plants lose their natural dwarf character. This applies also to most true Alpines, which we see too many of in greenhouses with their characters quite lost.

Anemone stellata Lam. (*A. hortensis* L.).

Root tuberous, brown. Stem 6–12 inches high, pubescent, bearing a single star-shaped flower. Leaves palmate, with 2–5 lobes, toothed, leathery, paler underneath, and sometimes purplish. Involucral bracts sessile, usually entire. Flowers usually rose, but sometimes deep red, violet or white, sepals 8–15, narrow; carpels woolly, oval-oblong, with glabrous beak.

This is another Mediterranean plant found in fields, vineyards, and dry, bushy places; but it is deservedly often cultivated. Very polymorphic, and the ordinary rose-coloured form is rarely seen in gardens, but is very attractive. It needs a dry, sunny place, in light sandy soil. March, April.

Distribution.—Mediterranean region of Europe, Asia Minor. Abundant on the French Riviera about Hyères, etc.

Anemone coronaria L.

This handsome Anemone with large purple, blue, red or white flowers is so well known as not to need any description here, especially as it is not Alpine, though eminently fit for the rock garden if planted in deep soil in a sunny position. The varieties *cyaneus*, *rosea*, etc., are merely differently coloured forms. The foliage is profoundly divided, and always looks pretty.

Dry fields and vineyards, and sometimes in the crops. February to April.

Distribution.—Mediterranean region of Europe and Western Asia.

Anemone apennina L.

Roots tuberous, blackish. Stem 6–10 inches high, slender, glabrescent; leaves resembling those of the common Wood Anemone; bracts of the involucre petioled, having the appearance of leaves. Peduncle erect; flowers pale blue, solitary; sepals 10–15, narrow, almost linear; carpels shortly pubescent, elliptic, with glabrous beak.

Rocky places and woods. April.

This looks best in large clumps, and is a very useful plant for open shrubberies and glades, and also for establishing round the base of some tree which will allow the sun to penetrate and open the flowers in spring, but protect it from the fiercer heat of summer. A top-dressing of leaf-mould and peat is beneficial.

Distribution.—Southern Europe; Italy, Corsica, Dalmatia, Herzegovina, Montenegro, Corfu. Occasionally it has strayed into woods and plantations in Britain, but is certainly not native here.

Anemone blanda Schott and Kotschy.

This beautiful species is like *apennina*, but larger, and it has round, bulb-like roots. It is a native of Greece. A good plan is to establish it on the margins of some bushes such as Rhododendrons, where it can have a mulch of dead leaves and peat moss later in the year, but it requires sun to open its blossoms, like *apennina*. Both these Anemones could be naturalised with the Wood Anemone (*A. nemorosa*) in grassy places on a warm soil.

Anemone ranunculoides L.

Rhizome horizontal. Stem and whole plant about the size of *A. nemorosa* (Wood Anemone), which it much resembles in habit as well as habitat. Leaves spring far from the stem, with 3–5 shortly petioled segments; leaflets of the involucre shortly petioled, resembling leaves. Flowers bright yellow, usually solitary, but sometimes in umbels of twos or threes; sepals 5–8, oval; carpels pubescent, with long glabrous beak.

Woods and meadows, and damp, shady places, especially on a limestone soil. March to May.

A useful subject to naturalise in shrubberies, where it will assume a variety of forms and sizes, according to situation, etc.; but it thrives well on a limy soil. It is occasionally found, apparently wild, in England and the south of Scotland, but is probably not indigenous.

Distribution.—Throughout France, but rare in the South, and fairly spread through Europe, but rare in Switzerland; Western Asia.

Anemone silvestris L.

Root short, with matted fibres. Stem 10–20 inches high or more, slender, downy. Leaves downy, cut into 5 rhomboidal segments, bi-trifid, incised-toothed; leaflets of the involucre stalked, resembling leaves; peduncle always erect. Flowers white, large, solitary; sepals 5–8, oval; silky outside; carpels woolly, numerous, forming a tight oblong head.

Woody places. May, June.

An ornamental plant for the borders of shrubberies and shady places in gardens; and it grows particularly well under large ferns in a rockery.

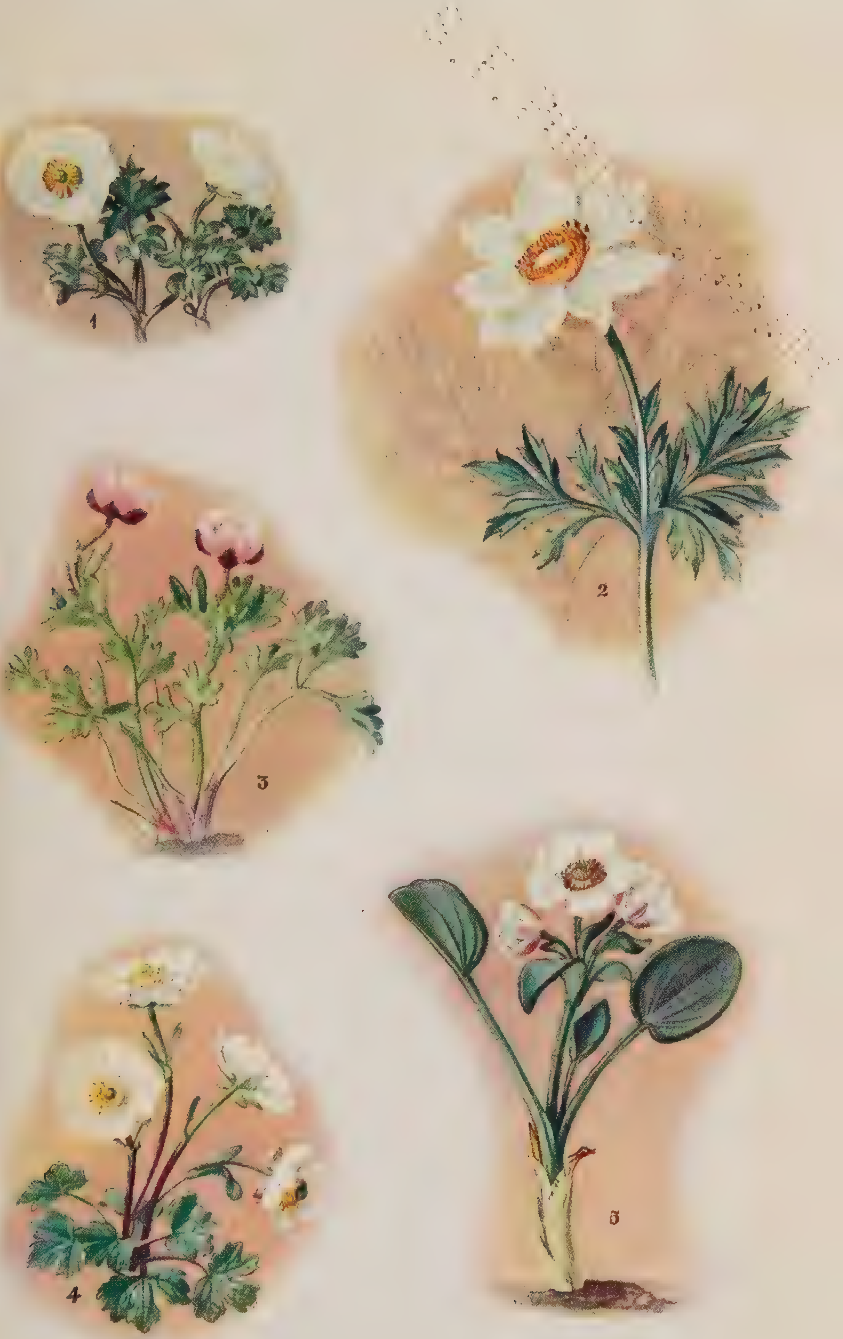

PLATE III.

1. Ranunculus Seguieri Vill.
2. Anemone alpina L.
3. Ranunculus glacialis L.
4. Ranunculus alpestris L.
5. Ranunculus parnassifolius L.

Distribution. — North of France, Alsace-Lorraine; Central Europe, from Southern Sweden to the Caucasus; Western Asia. In Switzerland only in Canton Basle.

Anemone baldensis L. (Plate II.)

Rootstock long, oblique. Root-leaves on moderately long stalks. Stem about 6 inches high, though shorter in high elevations, covered with soft wool. Bracts 3, with short, broad stalks, deeply tripartite, the central division 3–5 cleft, the lateral divisions 2–3 cleft. Flower-stalk covered with soft wool, elongated when in fruit. Sepals ovate or lanceolate, obtuse or less often acute, hairy at the base. When the fruit is ripe the style projects above the thick reddish wool, as in *A. silvestris*, which gives it the appearance of a strawberry. Flowers solitary, star-shaped, white, pale violet without.

Stony, gravelly places, from 6000 to 9000 feet in the high Alps, but never in great masses. July, August.

Distribution.—French, Swiss, and Italian Alps; Montenegro.

In Switzerland only in a few places, as in Val Bavona, the Chaine du Vanil-Noir, and the mountains above Bex and Aigle. At Mont Cenis in Piedmont it is in fair quantity at from 7000 to 8000 feet above sea-level.

It is difficult to cultivate. Mr. Reginald Farrer says he has 'never yet solved the riddle of *A. baldensis*, which ought to be so easy, and yet with me has not proved satisfactorily prosperous and floriferous under any treatment.'

Anemone trifolia L.

Radical leaves usually wanting at time of flowering. Involucral bracts 3, with simple serrate segments. Sepals glabrous beneath, usually 6, white, but very rarely blue.

Bushy places and woods up to 5500 feet. June, July.

Distribution.—S. Tyrol to Carinthia.

Anemone alpina L. (Plate III.)

Rootstock thick, and extending into a long fibrous tap-root, sometimes a foot long. Stem 6–18 inches high. Root-leaves ternately decompound, segments deeply cut. Bracts ternate, shortly stalked, resembling the root-leaves. Flowers solitary, white, sometimes tinged with blue below, large, but variable in size, and blossoming before the leaves are fully developed. Sepals usually 6. Carpels, as well as the very long beard, villous. The heads of feathery seeds form conspicuous objects in July and August. The seeds are at first reddish-brown, and arranged spirally, like the wires of a bottle-cleaner, and they all turn upwards stiffly; then they gradually bend horizontal and downwards, and the colour turns a dull mauve.

Pastures and rough ground on steep slopes in the Alps and sub-Alps, May to July, remaining till August in the higher Alps. It prefers limestone.

Distribution.—Carpathians, Eastern, Central and Western Alps, including the Maritime Alps; Vosges, Jura, Auvergne, Erzgebirge, Pyrenees, Corsica; Caucasus; North America.

Anemone sulphurea L.

This is probably only a variety of *A. alpina*, and usually seen on the older rocks. The flowers are a clear yellow colour, and often larger than the white ones. The distribution, except as to geological formation, is fairly co-extensive with the last, and in cultivation it may be treated in much the same way. The seeds, collected so easily in August, are difficult to germinate, but sometimes they come up after a second year, when sown in November in good, peaty soil, watered with a fine spray, and screened from the sun in a greenhouse or cold frame. The seedlings should remain two years, and then be transplanted, or, according to Mr. William Robinson, in *The English Flower Garden* (1907), page 436, the seeds are better sown out of doors in a moist, peaty soil. It is very difficult to get up the long tap-roots complete, and with plenty of fibre, so that imported specimens frequently die.

In the *Gardeners' Chronicle* for April 16th, *et seq.*, 1910, is a correspondence by Messrs. E. H. Jenkins, Reginald Farrer, and the present writer on this plant, with photographs of imported and home-raised roots of *A. sulphurea*, by Mr. Jenkins, showing how destitute of root-fibres the average imported plants are. This applies also to many other Alpines, which are sometimes ruthlessly torn from their original positions; and Mr. Jenkins points out the greater value of home-raised seedling plants as compared with collected specimens, a remark which for several reasons we heartily agree with. We would again suggest that this Anemone be tried not only in flower-beds, but also in turf in parks, and especially on rough pasture, where groups of the plant would look remarkably well. Any well-drained slope, preferably facing north-west or south-east, should be suitable, but *A. sulphurea* does not like lime, as *Alpina* does, as all who have kept their eyes open when in the Alps must have noticed.

On an Alpine pasture near the top of the Simplon Pass, at about 6000 feet, on the south side, the yellow Anemone was (on June 3rd, 1908) growing side by side with the English Wood Anemone, but the latter were deeper in colour than usually in England.

Anemone vernalis L. (Plate II.)

Rootstock moderately thick, oblique. Stem 3–5 inches high, silky. Leaves somewhat shaggy, pinnate; leaflets broadly wedge-shaped, in 2–3 pairs, 3 cleft, the divisions ovate, entire or 2–3 toothed. Involucre of 3 sessile, multipinnate bracts, villous, with yellowish red hairs. Flowers large, nearly erect; sepals connivent, white within, reddish and finally bluish on the outside, villous, with yellowish red hairs. Carpels oblong, villous, with long plumose beak. It opens its flowers immediately after the snow has melted.

Dry pastures of the Alps and lower Alps, 3500–9000 feet. April to July.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Riesengebirge, Alsace-Lorraine, North Germany; Carpathians, Scandinavia, Siberia.

It wants a south position in deep, sandy loam, and should be top-dressed after flowering, for unless the young surface-roots are top-dressed it often grows out of the ground.

Anemone Halleri All. (Plate I.)

Villous, with white, shining glandular hairs. Root thick, oblique. Stem taller than in *A. vernalis.* Leaves pinnate, with segments in 2–3 pairs, pinnatifid, the lobes 2–3 cleft; ultimate segments entire or 3-cleft. Bracts of involucre sessile, linear-lanceolate, very hairy. Flowers usually lilac, rarely white or rose-coloured, large, erect, solitary; sepals 6, elliptic, silky outside; carpels with long plumose beard.

Southern slopes and dry pastures at about 5000 feet. May, June.

Distribution.—Carpathians, Eastern Alps, Switzerland (only in Valais), Italian Alps, Dauphiny, Provence, Poland.

Anemone Pulsatilla L.

Though not Alpine, this well-known plant is most suitable for dry places on the rockery. The leaves are deeply cut into linear segments, and the whole plant is very hairy. The flowers are large, solitary, erect, or finally drooping. The carpels are furnished with a long plumose beard, as in the two previous species. The plant is very acrid, and has certain medicinal properties.

Dry, stony, sunny places, especially on chalk and limestone. March to May.

Distribution.—Almost the whole of Europe; Siberia. In Britain now confined to a few chalk hills in the south and east of England. A beautiful white variety is sometimes cultivated. Both it and the type should have very little water. Even without water it forms strong tufts, larger than in the wild state, but perhaps never so beautiful. A peculiarity of this species is that if moved in a state of rest, i.e. when not making growth, it often refuses to start into growth.

ADONIS L.

Characters those of *Ranunculus*, except that the petals have no nectary, though often deeply coloured at the base, and the seed is suspended, not erect, in the carpel.

A small genus, chiefly from Southern Europe and Western Asia.

Adonis vernalis L.

Stem about a foot high, almost glabrous; lower leaves reduced to scales, the others herbaceous, multifid, with linear segments. Flowers pale yellow, large, petals 10–15, lanceolate or oblong; carpels oval, rounded, pubescent, with short recurved beak.

Dry pastures, stony or wooded. April, May.

Distribution.—In one or two places in the Valais, where the natives are fast exterminating it by selling the roots at Montreux, etc.; Cevennes, Alsace, Spain, Central and South-eastern Europe.

Adonis pyrenaica D. C.

Stem about a foot high, slightly hairy; leaves all herbaceous, the lower ones large and longly petioled, 3–4 pinnate, with linear segments. Flowers bright yellow, petals 10–15 oboval; carpels oval-prismatic, angular, pubescent, with long, tapering, recurved beak.

Rocks and cliffs; rare. 6000–6500 feet. June, July.

Distribution.—French and Spanish Pyrenees; and in one or two places in the Maritime Alps.

Both these handsome plants should have a south aspect, and good, deep, sandy loam, and well drained. They will benefit by some top-dressing in autumn. The plants can be taken up and divided every three or four years in the early spring. If the Asiatic species, *A. amurensis*, is also grown, on account of its early flowering, a succession of these beautiful blooms can be had from February until midsummer. It is better to buy the fresh seed of *A. pyrenaica* than collected plants direct from the Continent, for it is very rare, and as we once observed in the Eastern Pyrenees, it is difficult to coax the roots out of the crevices of the cliffs.

Ranunculus L.

Annual or perennial herbs, sometimes entirely aquatic. Leaves entire or more or less divided. Flowers usually yellow or white. Sepals 5, very rarely 3. Petals 5 or more, each with a thickened hollow spot at the base, often covered by a minute scale. Stamens numerous. Carpels numerous, without awns, in a globular or oblong head, each with a single ovule attached near its base. A large genus, spread widely over the temperate regions of the globe, and even found in the tropics.

Ranunculus parnassifolius L. (Plate III.)

Stem 3–8 inches high, 2–4 leaved, cottony. Leaves cordate-ovate, entire, nerved, coriaceous, woolly on the upper side, cauline leaves lanceolate, embracing the stem. Flowers white, usually at length reddish on the outside, solitary, or in an umbel. Achenes bladdery, ovate, glabrous, without any margin, with a fine hooked beak. Receptacle hairy. Tips of sepals reddish. Screes, moraines, and rocky places on the high Alps, near the snow line, on limestone and schist. 7000–9500 feet. Rare. June, July.

It likes a strong loam, well drained, and will do well on the north side of the rockery, and benefits by top-dressing.

Distribution.—Eastern Alps (Tyrol and Carinthia), Central and Western Alps; Eastern and Central Pyrenees, Spain, Italy.

Ranunculus amplexicaulis L.

Stem 4–10 inches high, simple or slightly branched, glabrous. Leaves glabrous or with a few long hairs, entire, thick, nerved; root-leaves oval lanceolate, stem-leaves lanceolate, amplexicaul. Flowers usually solitary, white; carpels oval, with prominent nerves and recurved beak.

Elevated pastures in the Eastern and Central Pyrenees, Northern Spain from Catalonia to Asturia. June, July.

Ranunculus pyrenæus L. (Plate II.)

Root-fibres cylindrical, narrowing towards the apex. Stem 3–10 inches high, simple or slightly branched, glabrous, cottony above; leaves glabrous, entire, thick, linear or lanceolate, the upper ones sessile. Flowers white, usually single, though sometimes several; carpels obovate, convex, smooth, without any ridge; beak slender, hooked. Very polymorphic, and with any number of petals, so that it is frequently double, especially in the Maritime Alps. *R. plantagineus* All. and *R. angustifolius* D. C. are merely varieties.

Very high and rather damp Alpine pastures. 6000–8500 feet. June, July. Often covering great areas.

Distribution.—Eastern, Central, and Western Alps, but rather local; French and Spanish Pyrenees.

Ranunculus aconitifolius L. (Plate II.)

Rootstock short, premorse, tufted with thick fibres. Stem erect, 1–3 feet, leafy, branched above, 3–many flowered, flexuous, glabrous like the leaves, or with a few scattered hairs. Root-leaves and lower stem-leaves stalked, developing before the flowers, palmate 3–7 cleft; segments 2–3 cleft, or undivided, unequally serrate, acute; stem-leaves more shortly stalked or sessile, less divided, less serrate. Flowers forming a terminal cyme; petals white, obovate, obtuse. Carpels veined and furrowed, large, glabrous, with a short curved beak. The sepals, which envelop the buds before opening (when they fall) are a beautiful purplish colour. Very variable, both in the height of stem and in the numbers of leaves and flowers. The leaves are thin and dark green.

The variety *platanifolius* L., commoner in the Eastern Alps, has a tough, not zigzag stem and glabrous peduncles.

Wet meadows, borders of streams, and shady, stony places, in clefts of rocks and by springs in the mountains; and often brought down to a low elevation by mountain torrents. June to August. 2000–8000 feet.

In cultivation it does best in cool, damp, rocky places under trees, and can be associated with such vigorous plants as *Adenostyles, Achillea macrophylla, Mulgedium alpinum*, etc.

Distribution.—Eastern, Central, and Western Alps; Carpathians; Sudetic Mountains; Black Forest; Vosges; Jura; Cevennes; Corbières and Pyrenees; Corsica.

Ranunculus crenatus W. et Kit. (Plate IV.)

Stem erect, 3–6 inches high, usually 1-leaved and 1-flowered, glabrous. Leaves roundish cordate or reniform, undivided or slightly 3-cleft near the apex, crenate; stem-leaves linear. Flower-stalk furrowed. Calyx glabrous. Flowers white; petals obovate, with wavy margin, crenate. Achenes smooth without any membranous margin, glabrous, globular, drawn out into a striated hooked beak. August.

Distribution.—On some primitive Alps, 3500–6800 feet, rare; Carpathians, Styria, and Eastern Alps.

Can be planted in deep, sandy soil in sunny positions.

Ranunculus glacialis L. (Plate III.)

Root premorse, covered with scales, fibrous. Stem 2–6 inches high, 1–3 flowered. Root-leaves ternate, usually hairy; leaflets tripartite or 3-cleft, divisions narrowly lobed. Calyx woolly; sepals hairy, ferruginous, persistent. Flowers white, at length reddish after fertilisation. Carpels numerous, glabrous, winged above, with a slight beak.

Damp moraines in the neighbourhood of glaciers, borders of Alpine lakes, sometimes covering great areas, as in the extensive flat basin below the Col de la Leisse in Savoy; siliceous rocks, occasionally up to 12,000 and even 13,000 feet. In fact, Schroeter gives the zone for this plant at from 2300–4270 metres, and it has been found near the top of the Finsteraarhorn at 4275 metres (14,000 feet), the highest limit known for any flowering plant in Europe. Dr. Lino Vaccari gives its extreme limit on the Grivola at from 3700–3800 metres. Possibly there is no flowering plant so frequently found at such a great altitude in Europe, though *Androsace glacialis, Saxifraga biflora*, and *S. oppositifolia* are not far behind. But, unlike *S. oppositifolia*, and many other high "Alpines," it is not carried far down the valleys and moraines by streams, etc. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Mont Ventoux, Eastern and Central Pyrenees; Arctic and Central Europe, Spitzbergen, etc.; India.

It appears to be more easily cultivated in England, even in the neighbourhood of London, than in Swiss gardens; though not often seen on rockeries. Mr. Wm. A. Clark, formerly Alpine foreman at the famous York Nurseries of Messrs. James Backhouse and Sons, says: 'A well-drained place must be chosen facing south or south-west, either on a sloping bank or on the level. Make a compost of leaf-mould, sand, and good loam, equal parts. Take out the existing soil, drain the part well, then fill in the prepared compost 6 inches, then put in the plants. If planted when dormant, the crown should be buried 2 inches below the surface. Make firm on the top; watering should be commenced as soon as the little crown begins to push through the ground if it is very dry weather. This will be in the month of March. After March, water must be given daily until the plants are in flower, then watering should gradually stop. By this time it will have made small runners. These should be carefully pegged down and a little top-dressing put over the margin of the bed, to enable the runners to form eyes and take root. . . . As soon as the leaves are all gone, the watering may cease altogether until the following spring, when the same treatment will be required.'

Ranunculus alpestris L. (Plate III.)

Root-stock cylindrical, oblique or vertical, tufted, covered with thick fibres. Stem erect, 2–4 inches high, leafless or 1–2 leaved, simple, usually 1-flowered, glabrous like the entire plant. Root-leaves stalked, cordate-rounded or reniform, undivided or digitate, or cleft and coarsely crenate, appearing before the flowers. Stem-leaves smaller, linear or wedge-shaped, entire, obtuse, sessile, the base broader and membranous at the margin; leaves somewhat rugose, shining on the upper side. Flowers snow-white; petals usually 5, obcordate, often 3-lobed. Achenes smooth, glabrous, with a long hooked beak.

Locally abundant (especially on calcareous soil) in pastures and damp, stony places on the Alps from 5000–8500 feet. June, July. Below the famous Joch Pass, leading from Engelberg to Meiringen, the damp rocks and stony pastures at about 7000 feet are in July purple and white with myriads of blossoms of *Primula integrifolia* and *R. alpestris*. But directly one gets west of Switzerland this buttercup becomes rare. In 1907 I did not see a single specimen, though making a special study of the high Alpine flora in the Maritime Alps, in Piedmont, Dauphiny, and Savoy during the whole summer.

Distribution.—Carpathians, Eastern and Central Alps; rarely in Savoy and Dauphiny; Jura, Eastern and Central Pyrenees.

R. alpestris can be planted in a mixture of peat, loam, and leaf-mould, with a little grit added, but the place must be well drained and with a little shade. Snails must be kept off in the early spring, as they are fond of eating the crowns when just appearing.

Ranunculus Traunfellneri Hoppe. (Plate IV.)

Stem 1–3 inches high; leaves not shining, where it differs chiefly from *A. alpestris*, which it resembles, and of which it is sometimes considered a variety. Leaves veined; root-leaves 3-partite, reniform in outline, the central lobe 3-cleft, the divisions lanceolate. Stem 1-flowered, usually with one leaf; stem-leaf linear, undivided. Flower-stalk furrowed. Calyx glabrous. Petals obcordate or 3-lobed, white.

Dry places on limestone, at about 5500 feet; rare. June, July.

Distribution.—Eastern Alps; Tyrol to Carniola.

Ranunculus Seguieri Vill. (Plate III.)

Stem erect, roundish, 4–8 inches high, 1–5 flowered. Entire plant glabrous below, hairy above. Root-leaves with cordate outline, 3–5 cleft, lobes irregularly pinnatifid; divisions 3–5 cleft; segments lanceolate, apiculate. Calyx glabrous. Flowers white; petals obovate, rounded, almost truncate. Achenes ovate, hairy, slightly stalked or membranous at the margin, with a hooked beak.

Rocky places and screes on high calcareous mountains; 6500–7700 feet; rather rare, and not found in Switzerland. June, July.

Distribution.—Alps of Dauphiny and Provence, Mont Ventoux, Italian Alps, Apennines, Carinthia.

Ranunculus rutæfolius L. (*Callianthemum rutæfolium* C. A. Meyer). (Plate IV.)

Stem 4–8 inches, simple. Leaves all radical, pinnate; leaflets pinnatifid; segments 3–4 lobed, imbricate. Flowers white, solitary, sometimes reddish outside. Sepals glabrous. Petals 5–12, orange at the base. Carpels in a globular head with short beak.

Wet pastures of the high Alps and stony slopes; rather rare; 6000–8300 feet. July–August.

Distribution.—Carpathians, Eastern, Central, and Western Alps (very local in Switzerland), Northern Asia.

Ranunculus anemonoides Zahl.

Root-stock cylindrical, knotted, oblique or vertical, tufted, covered with thick fibres. Stem erect or ascending, 1–2 leaved, or only with 1 or 2 scales, simple, 1- or very rarely 2-flowered, glabrous like the entire plant. Root-leaves appearing at the same time as, or later than, the flowers, stalked, doubly tripartite or doubly pinnatifid; divisions 3-multifid, with linear-lanceolate obtuse tips; lower stem-leaf smaller, less developed, with shorter stalk, 3-multifid; upper stem-leaf sessile, 2–5 cleft; or one or both stem-leaves are replaced by 1 or 2 narrow scales. Petals 9–20, white, with yellow spot at the base, linear-wedge-shaped, obtuse, emarginate or indented at the apex. The white, handsome flowers resembling those of an Anemone. Achenes coarsely veined, glabrous, with a short hooked beak.

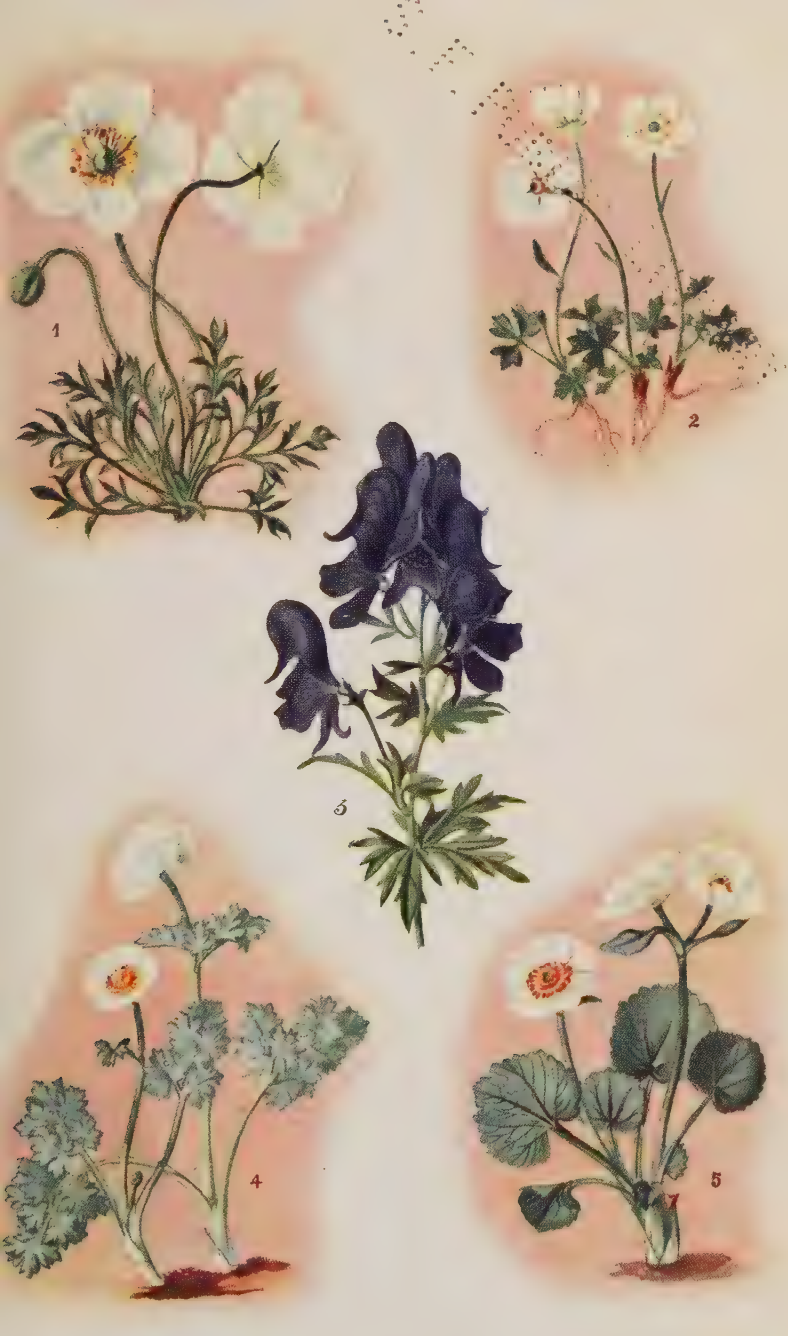

PLATE IV.

1. Papaver alpinum L.
2. Ranunculus Traunfellneri Hoppe.
3. Aconitum paniculatum Lam.
4. Ranunculus rutæfolius L.
5. Ranunculus crenatus W. et K.

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Stony limestone pastures, from 5000–7000 feet, in the Eastern Alps (South Tyrol and Styria). April, May.

It likes a sunny place on the rockery, in deep loam and limestone, and it should be top-dressed or replanted just after flowering, or it will work out of the ground.

Ranunculus montanus Willd. (*R. geraniifolius* Pourret). (Plate V.)

Root fibrous. Stem 4–12 inches high, erect. Root-leaves palmate; divisions obovate, 3-cleft, obtusely toothed. Lowermost stem-leaf 5-cleft; divisions linear, palmately diverging; upper stem-leaf 3-cleft, 1–3 yellow flowers. Sepals spreading, pubescent. Carpels marginate, convex on both sides; beak somewhat curved, very short. Receptacle bristly.

Alpine and subalpine pastures and woods; 3500–8200 feet; common. June to August. Very variable, and with several named varieties, of which *R. Villarsii* DC. is a beautiful dwarf, large-flowered form, found occasionally as high as 8800 feet in the Western Alps, as on the Col de la Leisse in Savoy.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Black Forest, Corbières, and Pyrenees; Western Asia and North Africa.

Like most of the Buttercups, this is easily cultivated, and requires no special treatment if placed in good soil and away from the driest part of the rockwork.

Ranunculus Thora L. (Plate V.)

Root-stock with spindle-shaped roots in bundles. Stem 4–12 inches high, 1–5 flowered, simple, glabrous like the whole plant. Lower stem-leaves sessile or shortly petioled, rounded kidney-shaped, toothed or crenate-toothed, the next leaves with 3–5 lobes, and the others lanceolate entire. Flowers small, yellow. Petals 5. Sepals glabrous. Carpels almost globular, with a short beak.

Steep, stony places in the Alps, in the Pine region and above, up to 7000 feet. June, July; not common.

Distribution.—Carpathians, Eastern Alps, Switzerland, Jura, Savoy, and Dauphiny; Italian Alps and Central Pyrenees.

Ranunculus scutatus Schott.

This species closely resembles the last, of which it is considered a variety by some botanists. It is taller and stouter, with more branched stem and larger flowers.

Its habitat is similar, but it is not found quite so high in the Alps. June, July.

Distribution.—Eastern Alps.

Ranunculus hybridus Biria.

Rootstock cylindrical, oblique, ringed, with fleshy cylindrical or tapering fibres. Stem erect, simple or branched above, 1–5 flowered, glabrous like the entire plant. Radical leaf long-stalked, reniform, broader than long, obtuse, and unequally lobed towards the apex, often wanting; lowermost stem-leaf of the same form, but with shorter stalk or sessile; upper ones smaller, 2–5 cleft; floral leaves lanceolate, undivided. Sepals and petals usually 5. Carpels in a nearly spherical head, glabrous, keeled, swollen at the base, with a long curved beak, half as long as the carpel. Stem 3–6 inches high, with two or three golden-yellow flowers; leaves greyish green.

Stony spots and on the debris of rocks. June, July.

Distribution.—Carpathians, Eastern and Central Alps; but not in Switzerland.

There are two Mediterranean Crowfoots which are so elegant and suitable for dry, hot places in the rock-garden that they may be briefly mentioned here:—

Ranunculus chærophyllos L.

Rootstock short, with a bundle of cylindrical fibres. Stem 4–12 inches, erect, simple or slightly branched, with silky hairs like the leaves, which are mostly radical, tripartite or pinnatifid, with narrow lobes. Flowers yellow, large, shining, generally single. Carpels in an oval or oblong head, keeled, with a longish, almost straight beak.

Dry, uncultivated ground. April to June.

Distribution.—Corsica, Western and Southern Europe; very common on the French Riviera, Western Asia, North Africa.

This species is very variable, and has several varieties; one, common in the Isle of Porquerolles, off Hyères, having all its leaves densely clothed with short ash-grey hairs.

It should succeed in sandy soil in a hot position and where water does not accumulate in winter.

Ranunculus millefoliatus Vahl.

This is a slightly larger plant, with handsome golden-yellow corollas, single or in pairs, and the leaves are tripinnatifid with short, narrow, and pointed lobes. The peduncle is robust and thick. The carpels are keeled and have a prominent curved beak, much hooked.

Dry, uncultivated ground in hot places. April to June.

Distribution.—In France only in one place, in the Department of the Var; Southern Europe from Italy to Greece, Western Asia, North Africa.

Similar cultivation to *R. chærophyllos.*

Caltha palustris L. (Marsh Marigold).

Though associated frequently with low-lying meadows and marshes almost at sea-level in this country, it must not be forgotten how abundant the Marsh Marigold is in the Alps and Alpine valleys and plains. We have seen it at over 7000 feet by the Furka Pass in Switzerland, and at 8000 feet, or 2440 metres (the extreme limit of Alpine pastures), on the Col du Galibier in Western France. In spring and early summer it is often associated in the Alps with *Primula farinosa*, *Ranunculus aconitifolius*, and other plants. In Scotland it has been collected from over 3500 feet on Ben MacDhui and several other peaks.

Distribution.—Europe, Asia, North America.

Trollius europæus L. (Globe Flower).

Root tufted, with bushy fibres. Stem erect, 1–2 feet, simple and 1-flowered or branched and 2–3 flowered, glabrous like the whole plant. Leaves palmately 5-cleft, the lower ones stalked, upper ones sessile; divisions rhomboidal, 3-cleft, unequally cut. Sepals almost closed into a ball, yellow. Follicle glabrous, linear, obliquely wrinkled.

Damp Alpine and subalpine meadows and mountain declivities, often in great masses, sometimes extending to 8000 feet in altitude. In Great Britain it is almost confined to subalpine districts in the north and west; but it actually descends, or did fifteen years ago, the valley of the Taff to within a mile or two of the town of Cardiff. May to July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Black Forest, Vosges, Jura, Auvergne, Cevennes; Corbières and Pyrenees; Europe, especially northern and central, as far as the Caucasus.

It grows freely in almost any soil, and thrives in a stiff loam with a moist subsoil. Globe-flowers rarely vegetate until the spring following the year in which the seeds are sown, but they do not attain full development until about the fourth year.

Helleborus niger L. (Christmas Rose).

Rootstock thick, oblique, knobbed, with black fibres. Stem erect, simple, glabrous like the whole plant, 3–6 inches high, usually 1, rarely 2-flowered, leafless, having 2 or 3 elliptical or ovate bracts in the upper part. Leaves radical, large, coriaceous, stalked, pedate, 7–9 cleft; divisions undivided or 2–3 cleft, linear-lanceolate or wedge-shaped, acute, toothed. Flowers nodding, handsome, 2–3 inches in diameter, white or rose-tinted, ultimately green. Petals and stamens yellow. Sepals petaloid, elliptical. Follicle (capsule) elongate, obliquely veined, with a long beak.

The leaves spring up after the flowers, but remain through the following winter. The rootstock contains a narcotic poison of a very fatal character. It is officinal.

Calcareous subalpine woods and rocky, wooded slopes, as high as the zone of *Pinus montanus*. January to April.

Distribution.—In Switzerland only in Canton Tessin. It is frequent in woods above Lago Lugano; rare in the Basses-Alpes and

Hautes-Alpes in France; Carpathians and Central Europe from Tessin to Roumania.

If deep cultivation is given on planting, *Helleborus niger* seems indifferent to subsequent treatment, provided it is not much disturbed. Lifting and dividing should be done in July, when the plant is strongest. Though garden specimens are often protected by a hand frame before and during flowering, the Christmas Rose sometimes suffers when removed from under glass, for though very hardy the protection of a glass tends to bring on the young foliage before its time.

Eranthis hiemalis Salisb. (Winter Aconite).

This subalpine plant, so well known in English gardens and shrubberies, is naturalised in Switzerland and Normandy as in England. It is indigenous in damp, wooded places in the Vosges, Jura, and Alps of Dauphiny and Provence, and in Central Europe as far east as Servia. It extends up to 5000 feet, and flowers in February and March.

AQUILEGIA L.

Perennial herbs, with the leaves mostly radical, ternately divided, with distinct stalked segments or leaflets. Sepals 5, coloured Petals 5, each prolonged below into a horn-shaped spur. Stamens numerous. Carpels 5, each with several seeds.

A small genus, spread over the temperate regions of the northern hemisphere, especially in hilly districts.

Aquilegia alpina L. (Plate V.)

Stem 1–2 feet high, 1–3 flowered. Leaves doubly ternate; leaflets deeply incised and 3-cleft, crenate. Flowers very large, the petaloid sepals broadly ovate, deep blue, the spur of the nectary somewhat curved. Petals 5, broad, paler blue, rather longer than the stamens. Follicles 5, densely covered with hairs.

Rocky, bushy places and escarpments in the Alps; 5000–6500 feet. July, August.

Distribution.—Not very frequent in Switzerland, where it attains its eastern limit in the Engadine; Alps of Savoy, Dauphiny, and Provence; Mont Ventoux and Northern Italy.

This is one of the most beautiful of Alpine plants, but it seems difficult to get the true thing from nurserymen, and often a bluish variety of *A. vulgaris*, or some more violet-coloured *Aquilegia*, is substituted for it. It was figured and described in 1910 in *The Botanical Magazine* (tab. 8303), but the colour is not good; indeed, the colouring of the modern plates in Curtis's *Botanical Magazine* often bears no comparison with that of fifty or a hundred years ago. 'A rich shade of blue-violet' does not correctly describe the colour of this species, which is rather a clear, bright blue. *A. pyrenaica* has blossoms of a slightly more violet shade; while those of

A. Reuteri, of the Maritime Alps, Liguria, Dauphiny, and Provence, are just the same clear blue as *A. alpina*.

The plant figured in *The Botanical Magazine* came from the Pleine Madeleine, near Chandolin, which village, in Val d'Anniviers, is 6493 feet above the sea, and one of the highest permanently inhabited villages in the Alps. According to Mr. Coolidge, the highest permanently inhabited village in the Alps, as well as in Switzerland, is Juf (6998 feet), in the Avers Valley (Grisons), not very far from the Maloja Pass.

Aquilegia alpina should occupy rather a moist and sheltered, but not shady, position in the rock-garden, in deep, well-drained, stony loam or peat; and it can be propagated from seed or by division. The seeds should be sown in early spring and the young plants pricked out into pans, and removed in August to their final position, care being taken to give them a little shading for several days.

Aquilegia Einseleana F. Schulz (*A. pyrenaica* Koch, not DC.).

Stem 6–12 inches high, tender, more or less covered with viscid, glandular hairs, especially above. Leaves glabrous, once or twice ternate, leaflets obovate-spathulate, 2–3 lobed, with rounded entire or slightly indented lobes. Flowers about 1 inch broad, purple. Spur of corolla nearly straight at the apex or curved, but not rolled up. Receptacle rounded, as long as or longer than the stamens.

Rocky places in the lower Alps up to 5000 feet. June, July.

Distribution.—Upper Bavaria, Tyrol (Salzburg), Carinthia, etc.

Aquilegia pyrenaica DC., not Koch.

Stem about a foot high, very slender, almost naked, with 1–3 flowers. Leaves small, 2- or 3-ternate, with entire or divided leaflets. Flowers blue, rather large, but smaller than those of *A. alpina*. Petals with rounded lip. Spur slender, straight, slightly longer than the lip. Follicles rather small (12–15 mill.).

Rocks and debris-strewn slopes in the Alpine region. July, August.

Distribution.—French and Spanish Pyrenees.

Aquilegia Reuteri Boiss.

Stem 1½–2 feet high, simple or slightly branched, often rather viscid, as several of the *Aquilegias* are, leafy, with 1–5 flowers. Radical leaves biternate, with deeply incised lobes; stem-leaves with several linear lobes or entire. Flowers bright, clear blue, in a narrow panicle, shortly peduncled. Petals with lip rounded or subtruncate. Spur curved back into a hook, equalling the lip in length. Stamens as long as the lip. Follicles small.

Woods and rocky places in the Western Alps. June, July.

Distribution.—Western Alps only, as Hautes-Alpes, Basses-

Alpes, Maritime Alps, Var, Liguria, and Piedmont; abundant in some of the Ligurian and Maritime Alps, at from 2400 to 5500 feet, where it takes the place of *A. alpina.*

Aquilegia vulgaris, var. *atrata* (*A. atrata* Koch).

This variety of the common Columbine has flowers of an almost black colour, an inch in diameter. In the Italian Maritime Alps the writer has seen it at about 5500 feet, but it is rare.

The Alpine Aquilegias are rather more difficult to cultivate than the Common Columbine (*A. vulgaris* L.), which also adorns many a subalpine glade or rough pasture in Switzerland and other mountainous countries, especially on limestone. Its flowers are of every shade of purple and mauve, and rarely white. The Alpine species are best sown from seed in spring obtained direct from the Alps, pricked out into pans or a cold frame, and then planted in early autumn in deep, well-drained loam with some grit in it. On rockeries they do well in half-shady but well-drained positions; and they appear to often thrive better in Scotland than in the south of England. One of the most beautiful hybrids, called *A. Stuarti*, was, we believe, first raised in the Royal Botanic Gardens at Edinburgh; but it is doing extremely well on the north and shady side of the famous Alpine Garden, the Jardin de la Linnæa, at Bourg St. Pierre, on the Great St. Bernard, at about 6000 feet above the sea.

Delphinium L.

Most of the European Delphiniums are annuals and not Alpine plants; but there are two perennials, Alpine or subalpine species, which deserve to be more cultivated. Like most of the others, they are of easy culture, and should be divided and replanted every three or four years in spring.

Delphinium fissum Waldst. and Kit.

Glabrous or hairy. Stem sometimes a yard high, robust. Leaves cut into 5–7 linear lobes, trifid, incised-dentate. Petioles dilated into a sheath at the base. Flower-stalks erect, pubescent, with two linear bracts near the centre. Flowers bright blue, sometimes tinged with green before fully expanded; in long spikes. Spur long and pointed. Petals bifid, the two inferior downy at the base. Follicles 3–5, glabrous or hairy. Seeds numerous, with imbricated scales.

Rocky and shrubby places in the south. June to August.

Distribution.—Hautes-Alpes, Basses-Alpes, Maritime Alps (at about 2000 feet in the Chestnut zone), Var, Bouches-du-Rhône, Gard; Southern Europe as far as the Caucasus; Western Asia.

Delphinium elatum L.

Stem 1–2 yards high, robust. Leaves palmately divided into 5–7 divisions, similar to those of *E. fissum*, but the lobes less linear,

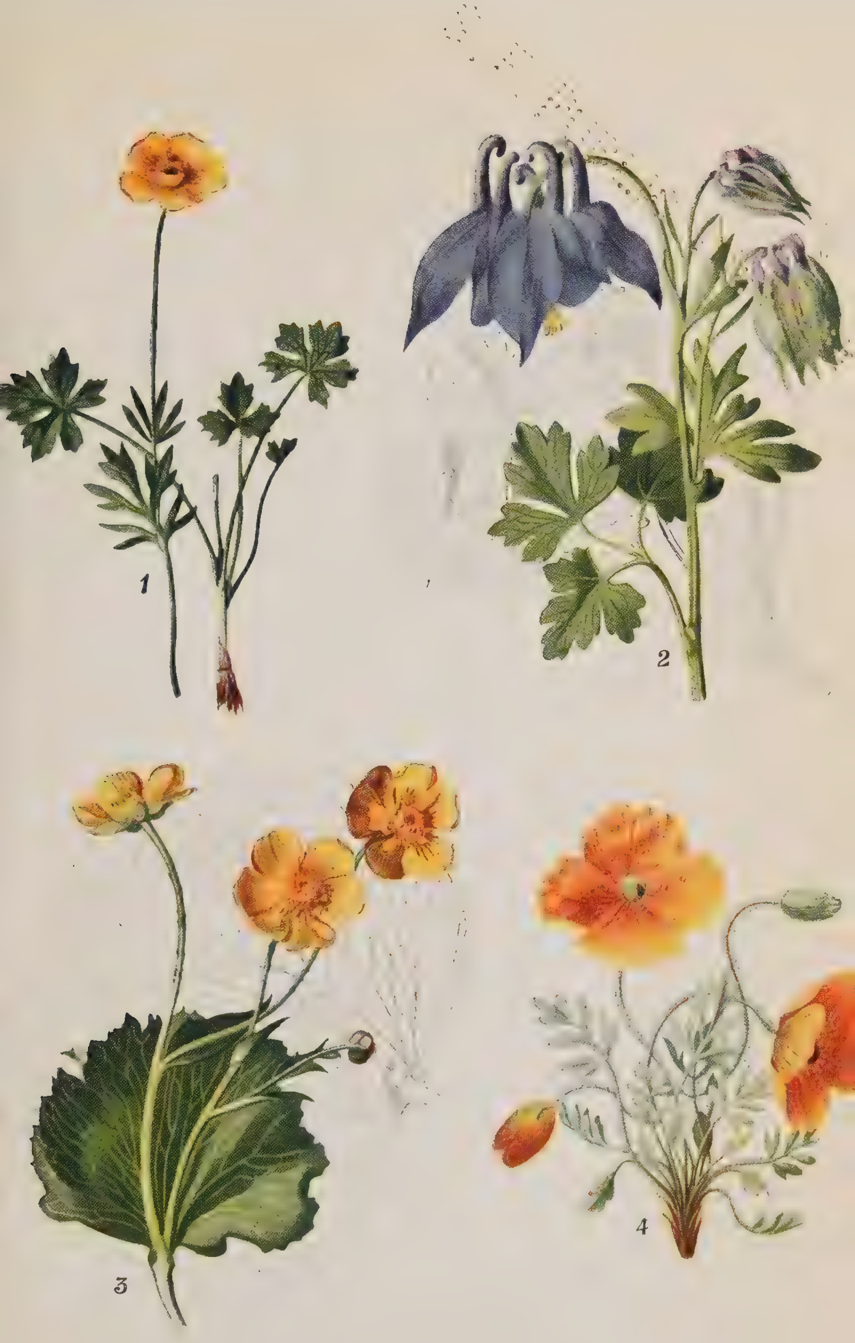

PLATE V.

1. Ranunculus montanus Willd.
2. Aquilegia alpina L.
3. Ranunculus Thora L.
4. Papaver aurantiacum Loisel.

and there is no sheath at the base of the petiole. Flowers bright blue, in long spikes. Petals downy.

Meadows and stony escarpments in the mountains up to 6500 feet, e.g. on the rocks near the Trübsee, above Engelberg. June to August.

Distribution.—Central Europe (not in the Jura) as far as the Caucasus, Eastern Pyrenees ; Siberia, India. This species is often cultivated.

ACONITUM L.

Perennial herbs with much-divided leaves, the segments palmate. Sepals 5, coloured, the upper one helmet-shaped, the two lateral broader than the two lower. Petals 2–5, concealed within the calyx. Stamens numerous. Carpels 3–5, each with several seeds.

A rather small genus inhabiting the mountainous parts of Europe, Asia, and North America.

Aconitum Anthora L.

Rootstock with 1–3 globular tubers covered with fibres. Stem erect, 1–2 feet high, glabrous below, downy above, like the flower-stalks and calyx. Leaves pedately or palmately 5–9 cleft, usually glabrous, except the root-leaves ; divisions palmately multisect, with narrowly linear segments. Flowers in a simple or branched terminal raceme, yellow. Calyx persistent after withering. Hood hemispherical and helmet-shaped. Follicle hispid or ultimately glabrous.

Stony places and pastures in the Alps. July to September.

Distribution.—Carpathians ; Jura, Switzerland (Tessin), Eastern Alps, Corbières and Pyrenees ; Western Asia.

Aconitum Lycoctonum L.

Stem attaining a yard in height, pubescent, branched. Leaves deeply palmately cut, with 5–7 broad segments, incised-dentate. Flowers pale yellow, in oval, elongated spikes. Sepals pubescent, soon falling. Hood cylindric-conical, much longer (higher) than broad. Follicles 3, glabrous or glabrescent, with seeds striated on every side.

Woods, gorges, and damp, shady places in the mountains. The writer has seen this as high as 7750 feet in Dauphiny. Somewhat polymorphic ; poison. June to August.

Distribution.—Almost all Europe ; Western Asia, India, Morocco.

Aconitum Napellus L. (Monkshood).

Tubers 1–3, turnip-like, covered with fibres. Stem erect, 2–5 feet high, lower part glabrous like the leaves, upper part downy like the flower-stalks and calyx, rarely quite glabrous, leafless below, densely leafy above. Leaves shiny, palmate, 5–7 cleft. Segments lozenge-shaped in outline, once or several times divided, with linear or lanceolate acute teeth. Flowers dark violet, very rarely purple, light blue, or white, in a terminal, elongated, crowded, simple, cylindrical raceme, rarely branched at the base into a panicle. Calyx deciduous. Hood obliquely hemispherical; claw of the two upper petals nearly semicircular, bent forwards, with horizontal or deflected cap. Spur capitate, somewhat bent. Follicles glabrous, less often downy, at first spreading, afterwards parallel.

Woods and damp meadows and pastures in the Alps and sub-Alps, especially by the herdmen's huts, descending streams into the plains; 3000–8200 feet. June to August. Polymorphic, poisonous, and medicinal.

Distribution.—Carpathians, Riesengebirge, Eastern, Central, and Western Alps; Jura, Vosges, Black Forest; Erzgebirge, locally in Germany as far as Holstein; France (except West and South), Central Asia, Siberia. In Britain in woods and by streams in South Wales and the south-west of England.

Aconitum paniculatum Lamk. (Plate IV.)

Rootstock with tubers like turnips. Stem 2–4 feet high, very leafy, flexuous, pubescent at the top. Leaves not shining, shortly stalked, more broadly and coarsely divided than in *A. Napellus.* Raceme more leafy, rarely quite simple, frequently paniculate from the branching of the lower branches. Flowers violet, often paler or white or greenish towards the base, very rarely quite white or blue. Hood handsome, 1–1½ inches, but variable in size and height. In the same inflorescence are often flowers in which the two upper petals have straight and curved claws, and the hood is erect, oblique, or nearly horizontal. Follicles 3-4, glabrous, spreading.

Damp woods and thickets and Alpine and subalpine districts, generally at about 5000 feet. July, August.

Distribution.—Carpathians, Erzgebirge, Jura (rare), Alps of Savoy and Dauphiny; Central Europe as far east as Roumania.

All these Aconitums can be easily naturalised in shrubberies or copses, or in the bushier and more shady positions in large rock-gardens.

Pæonia peregrina Miller.

Stem 1–2 feet high, simple, glabrous. Leaves 2–3 ternate, with rather narrow segments divided into 2–3 lobes, usually 2-trifid, hairy underneath. Petals oboval, pink, very large. Anthers shorter than the filaments. Follicles 2–3, glabrous or with tomentum, more or less divergent, and spreading at maturity.

Woods and pastures of southern mountains. May, June.

Distribution.—Provence, Languedoc, Roussillon, up to the Hautes-Alpes and l'Aveyron; Southern Europe from Portugal to Hungary and Greece. On one of the Ligurian mountains it grows at about 6000 feet.

This Pæony requires much the same treatment as most of the genus, and can be planted at any time from October to April in good moist loam. The ground should have been well trenched and manured if grown on an extensive scale.

Actæa spicata L.

Rootstock thick, blackish. Stem 1–2 feet high, glabrous, with 2 or 3 leaves in the upper part. Leaves large, thin, 2–3 ternate, with oval-acuminate leaflets, incised-dentate. Flowers white, small, in a short, oblong, terminal raceme. Corolla regular, with 4 petaloid sepals, easily falling. Petals 4, almost invisible. Stigma sessile; berry ovoid, green, and finally black and shining, with numerous seeds.

Damp, stony woods and steep, bushy declivities in subalpine districts, up to 5000 feet. May to July. Poisonous.

Distribution.—Nearly all Europe as far as the Caucasus; Siberia, India, North America. In Britain in the north.

BERBERIDACEÆ

Shrubs or herbs. Stamens opposite the petals, and the same number as them. Ovary of 1 carpel, with seeds attached to the bottom or to one side of the cavity. A small family spread over the temperate regions and tropical mountains of the globe.

Epimedium alpinum L.

Rootstock rampant. Stem erect, 1–1½ feet. Root-leaves scaly; stem-leaves biternate; leaflets petioled, oval, heart-shaped at the base, with aristate teeth. Flowers in a loose panicle, hairy-glandular, yellow, with blood-red centre.

Groves and thickets in the south and south-west of Europe. Occasionally seen in parts of Switzerland, but, as in Britain, subspontaneous and an escape from gardens. Not found in France.

Grows best in cool, peaty soil in a rather shaded position. April, May.

PAPAVERACEÆ

Herbs with alternate leaves and milky juice. Flowers regular, usually of 4 petals; sepals usually 2. Stamens indefinite. Ovules parietal. A family represented in the Alps and sub-Alps by very few species.

Papaver alpinum L. (Alpine Poppy). (Plate IV.)

Root tapering, with prostrate, scaly branches and loosely tufted. Stem erect, simple, leafless, 1-flowered, hispid, like the whole plant. Leaves all radical, stalked, doubly pinnate. Segments linear-lanceolate or wedge-shaped, entire. Flowers white with yellow centre, or yellow or orange when on granite soil. Stamens subulate. Capsules obovate, with stiff adpressed hairs.

Principally on limestone, or on granitic debris of the high Alps (6000–9000 feet), and sometimes descending into the valleys and beds of streams. June to August.

Distribution.—Eastern, Central, and Western Alps; Carpathians, Balkans, Apennines; high mountains of Europe from Spain to Norway; Northern and Central Asia.

In Switzerland it is represented by two sub-species: *P. Burseri* Crantz, a glabrous form found in the Alps of Gruyère, Chateau d'Oex, etc.; and *P. Sendtneri* Kerner, a hairy form with less cut leaves, which also grows above Chateau d'Oex and on Pilatus, etc.

The Arctic or Iceland Poppy (*P. nudicaulis*) is very similar to *P. alpinum;* and *P. pyrenaicum* Willd. is only a form of *P. alpinum*, though formerly some botanists considered it a distinct species.

Papaver aurantiacum Loisel. (*P. rhœticum* Leresche). (Plate V.)

Flowers yellow or orange. Leaves pinnatifid; segments thick, oval or broadly lanceolate, hairy. Flowering stem very hairy. Sepals covered with dark brown hairs. Capsule obovate, hispid, with erect, silky hairs.

Moraines and debris, especially on limestone. July, August.

Distribution.—In Switzerland in the Engadine and Valais (rare), Tyrol (Salzburg), and Carinthia.

The Alpine and Iceland Poppies are easily grown from seed almost anywhere in the garden, and they adapt themselves to any part of the rockery in sandy loam. A little seed may be scattered amongst the rocks, and it will soon germinate. The plants are better left undisturbed, and they 'sow themselves.'

CRUCIFERÆ

Herbs or rarely undershrubs with alternate leaves, and no stipules; the flowers in terminal racemes, which are usually very short, but lengthen out as flowering advances. Sepals 4. Petals 4, equal, or the two outer larger. Stamens 6, of which two are generally shorter. Ovary solitary, 2-celled. Style single, often very short, with a capitate or 2-lobed stigma. Fruit a pod, divided into 2 cells by a thin partition, from which the valves generally separate at maturity; or, in a few genera, the pod is 1-celled or indehiscent, or separates into several transverse joints.

An extensive family widely spread over the globe, but chiefly in the northern hemisphere. The characters of the genera are chiefly derived from the pod and seed; therefore to name a Crucifer it is almost necessary to have the specimen in fruit.

ARABIS L.

Annuals or perennials, usually erect and hairy, at least at their base, with a spreading tuft of radical leaves, which are occasionally lobed. The stem-leaves undivided, sessile or clasping the stem.

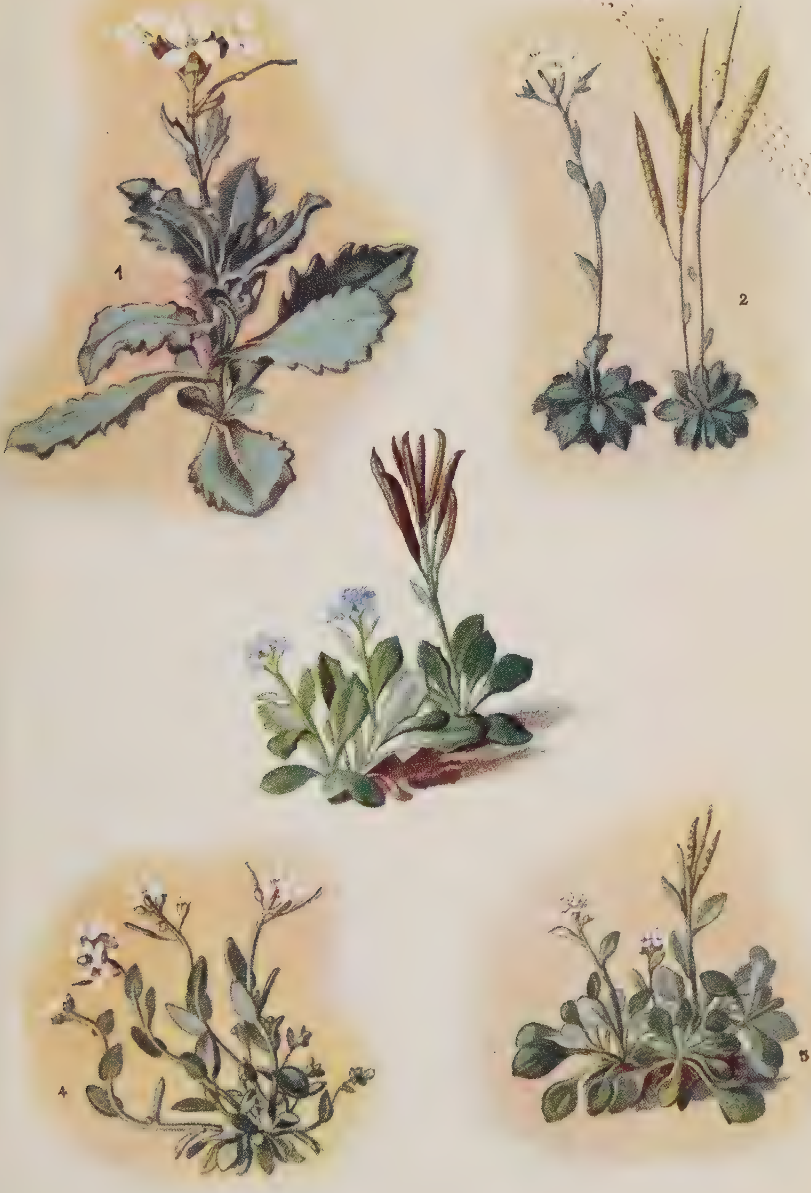

PLATE VI.

1. Arabis alpina L.
2. Arabis pumila Jacq.
3. Arabis cœrulea Hænke.
4. Arabis serpyllifolia Vill.
5. Cardamine alpina Willd.

Flowers white or purple. Pods long and linear; the stigma nearly sessile; the valves flat or slightly convex. Seeds more or less flattened, often winged.

A large genus spread over the temperate regions of the northern hemisphere.

Arabis alpina L. (Plate VI.)

Stem erect or ascending, 3–12 inches high, simple or patently branched, covered, like the leaves, with forked hairs, green. Leaves coarsely toothed, frequently with a wavy margin; root-leaves wedge-shaped, gradually narrowed below; stem-leaves ovate or ovate-lanceolate. Petals white, rather large, 3 lines long. Seed-vessels not adpressed, patent, 1–2 inches long, ¾ line broad; seed surrounded by a narrow membranous rim. Very polymorphic, and with one or two named varieties. Leaves thin and glabrescent when in shady places under rocks or trees.

Damp, rocky places in the Alps and sub-Alps, up to 10,000 feet, often descending lower in the beds of streams. May to August. The writer has collected this plant at 9800 feet on the Aiguille du Goléon in Dauphiny; at 9200 feet above Mont Cenis in Piedmont; at 9000 feet on the Col Giaset on the Franco-Italian frontier; at 9120 feet at the summit of the Col de la Leisse, in Savoy, etc.; and the var. *crispata* Willd. at 9000 feet on the Col de l'Iseran.

Distribution.—Carpathians; Eastern, Central, and Western Alps, Jura, Auvergne, Cevennes, Pyrenees, Corsica; almost all mountainous Europe; Scandinavia, Siberia, Himalaya.

Easily cultivated from seed in sandy loam—as, indeed, many species of Arabis are, but they like plenty of sun.

Arabis cœrulea All. (Plate VI.)

Roots with fusiform branches and many-tufted heads. Stem erect or ascending, 1–4 inches high, simple, with patent hairs. Leaves thickish, shining, slightly ciliated, otherwise glabrous; root-leaves erect, obovate-lanceolate, narrowed into the foot-stalk, with 3–5 teeth near the apex, otherwise entire, the middle tooth larger, broadly triangular; stem-leaves lanceolate or wedge-shaped, denticulate or entire, sessile on a narrow base. Petals erect, small, bluish, linear-wedge-shaped. Siliqua compressed, erect-patent. Seeds with a membranous wing about half as broad as the seed. Inflorescence a corymbose raceme.

Damp rocks and moraines near the melting snow at high elevations, especially on slate detritus. It rarely descends below 8000 feet, and is generally found from 8000–9200 feet. July, August.

Distribution.—Bavaria; Eastern, Central, and Western Alps; local.

It should be tried on moraines in the rock-garden, if possible near dripping water, but not where water stagnates in winter.

Arabis bellidifolia Jacq.

A glabrous and shining plant, or sometimes sparsely covered with simple hairs. Stem 6–20 inches high, erect, simple, leafy. Leaves thick, the root-leaves oblong-spathulate, slightly wavy; the stem-leaves oval or oblong, entire or toothed, half embracing the stem. Flowers white. Side sepals swollen at the base, shorter than the pedicel; anthers oblong. Fruiting spike elongated, with erect pedicels. Siliquæ long, numerous, erect, much compressed. Seeds broadly winged.

Springs and damp pastures in the high mountains, commonest at about 5000–6000 feet. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees.

Arabis pumila Wulf. (Plate VI.)

Root tapering, branched, with several crowns; root-crowns often resembling stolons, tufted. Stem erect or ascending, 3–5 inches high, simple, glabrous, or with fine hairs below. Leaves entire or slightly toothed, acute or obtuse, with simple and forked hairs, or only ciliate; root-leaves in a rosette, obovate or wedge-shaped, gradually narrowed below; stem-leaves linear or lanceolate, sessile. Petals white, obovate-lanceolate, patent. Seed-vessel erect, compressed; seed surrounded by a membranous wing half the width of the seed.

Rocks and stony places in the calcareous Alps, up to 8200 feet, often descending to the subalpine region. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Apennines.

Arabis stricta Huds. (*A. scrabra* All.) (Bristol Rock Cress).

Root long, tapering. Stem 3–10 inches, erect, simple, covered with hispid hairs like the leaves. Leaves leathery, shining, dark green and occasionally purplish, ciliated, wavy, with a few rounded teeth; radical leaves in a dense rosette, the cauline leaves 1–3, small, sessile, not auricled. Flowers a dirty white. Sepals equal, as long as the pedicels. Fruiting spike short, with widely erect pedicels. Siliqua erect, compressed. Seeds truncate and slightly winged at the summit.

Rocks, cliffs, and debris on limestone in the lower Alps. May to July.

Distribution.—East and south of France, Switzerland. Common on the Salève near Geneva, Jura, Pyrenees, Spain. On carboniferous limestone cliffs and screes near Bristol on both sides of the River Avon.

Easily grown from seed in sandy soil with some lime in it.

Arabis arcuata Shuttle. (*A. ciliata* Koch).

Biennial. A looser plant than the last. Stem 3–12 inches, hairy like the leaves, erect, simple. Leaves greenish grey, oblong, usually entire, not leathery; the radical leaves longly petioled. Flowers white, smaller than in *stricta*. The seeds are oval, and not winged.

Rocks and debris in calcareous regions in the mountains. June, July.

Distribution.—Central and Southern Europe, but not in Switzerland. Jura, Savoy, Dauphiny, Provence, Corbières, and Pyrenees; Piedmont, as at Mont Cenis.

The nomenclature of the varieties of *Arabis arcuata* seems much confused; var. *ciliata* Burnat grows at Mont Cenis up to 8500 feet; and var. *cenisia* Reuter the writer found at 9000 feet at Mont Cenis—only 2 cms. high.

Arabis serpyllifolia Vill. (Plate VI.)

Stem flexuose, and, like the leaves, whitish grey from branched hairs. Leaves narrowly ovate, entire or slightly dentate; radical leaves prolonged into a leaf-stalk; stem-leaves sessile. Flowers white. Siliquæ on short stalks, somewhat spreading, scarcely broader than the stalk, long, flattened, with a somewhat prominent midrib and lateral nerves. Seed not winged.

Rocks in the calcareous and lower Alps, up to 6000 feet. June, July.

Distribution.—Jura; Central and Western Alps.

CARDAMINE L.

Annual or perennial herbs, usually glabrous. Leaves pinnate or, if undivided, on long stalks. Flowers white or pink. Stigma capitate or small. Pod narrow-linear; the valves flat, without any conspicuous midrib.

A large genus, widely spread over the temperate and colder regions of both northern and southern hemispheres.

Cardamine trifolia L.

Rootstock slender, stoloniferous, knotted. Stem slender, naked or with one small leaf. Leaves ternate; leaflets rounded, petioled, almost equal, thick, shining, crenate. Flowers white. Anthers yellow. Fruiting spike short, erect. Plant with creeping runners.

Damp and shady places in lower mountains. April to June.

Distribution.—Central Europe from the Jura to Italy, and Transylvania. Very local in Switzerland, and in France only known from Mont Pouillerel in the Jura.

On rockeries it is easily grown in shady places, and owing to its creeping habit it soon covers a large area, and must be kept in check.

Cardamine asarifolia L. (Plate VII.)

A glabrous, bright green plant. Stem leafy, 1–1½ feet high. Leaves all simple, cordate-orbicular, coarsely dentate, shining. Flowers white, rather large. Anthers violet. Pods erect, twice as long as the stalk.

Damp, stony places in the mountains, especially by streams. July.

Distribution.—Basses-Alpes, and both French and Italian Maritime Alps, Piedmont, Tyrol, Spain.

Easily cultivated in wet, stony places, but not often seen in gardens, though a very distinct plant. It does not object to the shade of trees or rocks.

Cardamine latifolia Vahl.

Similar in habit and culture to the last species, from which it differs in having lyrate leaves with 3–7 large leaflets which are shortly stalked; the terminal leaflet is larger and suborbicular. The flowers are lilac, and the anthers yellow. The pods are erect, more spreading and on longer stalks than in *A. asarifolia*.

Springs and rivulets in the lower mountains. May to July.

Distribution.—Pyrenees, Corbières, Spain, North Italy.

Cardamine alpina Willd. (Plate VI.)

Rootstock many-headed. Stem 1–3 inches high, few-flowered, glabrous. Leaves somewhat fleshy, glabrous; root-leaves undivided, stalked, lyrate-ovate, obtuse; stem-leaves nearly or quite 3-lobed or somewhat incised, shortly stalked. Flowers small, white. Siliqua erect, compressed, scarcely ½ inch long, often tinged with blue. One of the smallest Alpine plants, and always found at a high altitude; sometimes at 10,000 feet.

Wet, stony places in high mountains. July, August.

Eastern, Central and Western Alps, Pyrenees, Carpathians.

Hardly worth cultivating.

Cardamine resedifolia L. (Plate VII.)

Stem curved, 2–6 inches high. Root-leaves undivided, oval, obtuse, stalked; lowest stem-leaves tripartite, or like the upper stem-leaves, pinnate, pinnæ obtuse, the terminal leaflet larger, leaf-stalk sagittate-auriculate. Flowers white, small. Siliqua erect. Seeds winged.

Debris and stony pastures on the primitive and siliceous mountains at a high elevation, extending to 10,000 feet. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Auvergne, Cevennes, Corbières, Pyrenees, Corsica. Central Europe from Spain to Silesia.

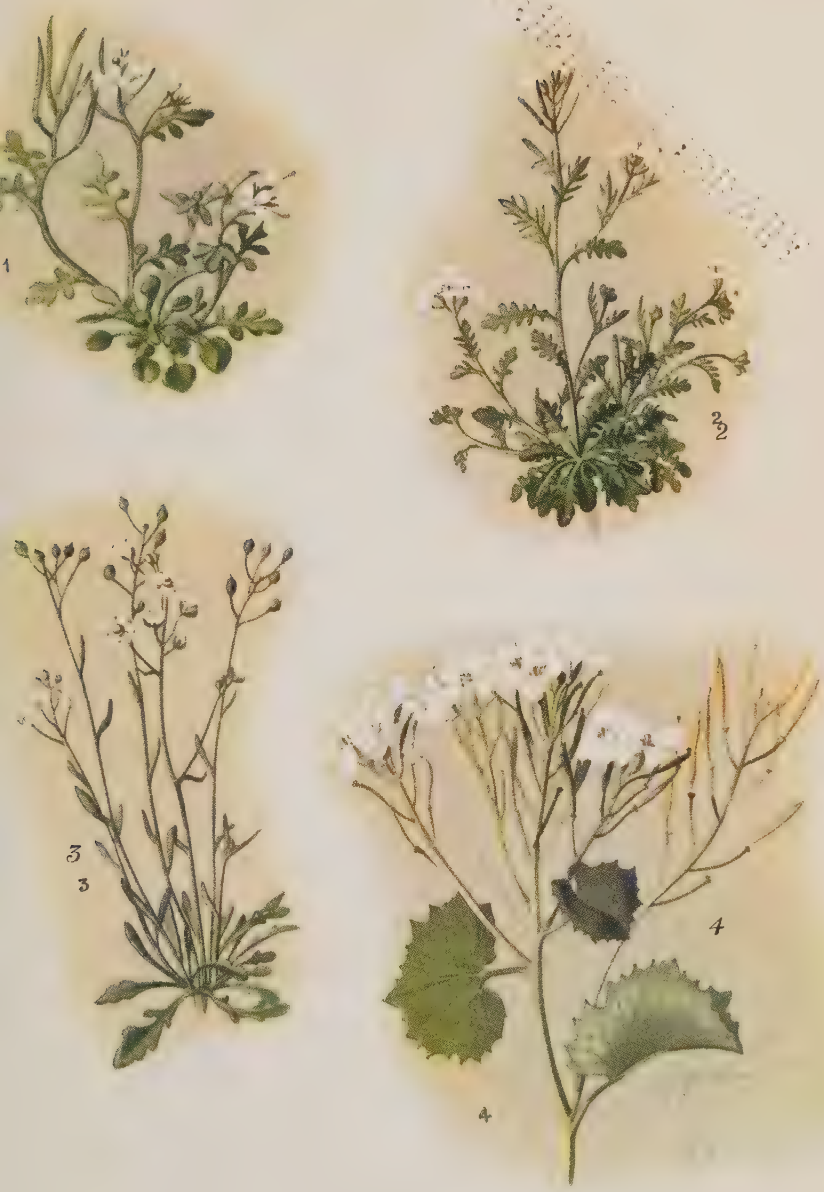

PLATE VII.

1 Cardamine resedifolia L.
2. Sisymbrium pinnatifidum D C.
3. Kernera saxatilis Rchb.
4. Cardamine asarifolia L.

[illegible]

DENTARIA L.

Perennials, with a horizontal, fleshy and toothed or knotted rootstock, and simple stems with a few large pinnate or stalked leaves and bearing rather large white or purple flowers. The other characters are those of *Cardamine*, except that the pod is rather broader and tapering at the top.

A small genus of handsome plants confined to the northern hemisphere. It is now usually merged in *Cardamine.*

Dentaria bulbifera L. (*Cardamine bulbifera* (L.) Crantz.)

Rootstock scaly, whitish. Stem weak, 1–2 feet high, bearing several leaves, often with a small ovoid bulb in their axil, the lower ones pinnate with 5 or 7 segments, the upper ones with fewer segments or quite undivided; all the segments lanceolate, entire or toothed, tapering at the base, 1½–2 inches long. Flowers few, rather large, bright lilac, rarely white. The pod is seldom formed, as the plant is propagated by the axillary bulbs falling to the ground and growing.

Woods and shady places in mountain districts. April to June.

Distribution.—Spread over Continental Europe from Scandinavia and the north of France to the Caucasus. In Britain in some of the 'home counties.'

Dentaria digitata Lamk. (*Cardamine pentaphylla* (Scop.) R. Br.)

This is a smaller plant, with no bulbils. The leaves are digitate and divided into 3–5 leaflets, which are oblong lanceolate and toothed irregularly. Flowers rose or lilac. Siliqua erect, spreading.

Mountain woods. May, June.

Distribution.—Central and Southern Europe. In France from the Jura and Vosges to the Pyrenees.

Dentaria pinnata Lam. (*Cardamine pinnata* (Lam.) R. Br.)

Rootstock scaly, obtuse. Stem stout, simple, 1½–2 feet. Leaves pinnate, with 5–9 leaflets which are opposite, ovate-lanceolate and irregularly toothed. No bulbils. Flowers large, lilac, rose or white. Petals three times longer than the calyx. Siliqua and pedicels erect, spreading.

Mountain woods in Central and Southern Europe from Spain to Styria. Not in the west or north of France and rare in the South. April to June.

In Switzerland *Dentaria digitata* is the commonest of the three, the other two species being somewhat local. Once in June, in walking down Pilatus towards Alpnach, on arriving at the lower Beechwoods, I made an extremely beautiful bouquet of the mauve *Dentaria pinnata* and the Common Marsh Marigold, with which it was associated in the damper places.

The Dentarias are useful spring flowers for shrubberies and shady borders, and might be more grown in England, for they do well in sand and peat or in sandy leaf-mould. They can be increased from the small tuber-like roots, or in the case of *D. bulbifera* by planting the bulbils.

LUNARIA L.

Petals purple or lilac. Fruit very large, flat, oval, or oblong, lengthened into a false pedicel above the real pedicel. Valves without nerves, seeds few.

Only two species inhabiting Europe and Western Asia.

Lunaria rediviva L.

Stem about 3 feet high, erect, branched at the top, generally though not always glabrous. Leaves petioled, ovate-cordate, finely toothed. Flowers violet, veined, sweet-scented. Pods oblong-elliptic, pointed at both ends, drooping finally.

Mountain woods up to 5000 feet. May to July.

Distribution.—Almost all Europe, from Portugal to Sweden and Russia; Siberia. Very local in Switzerland, as e.g. in woods near Engelberg.

It might be grown in shady gardens and at the back of big rockeries under trees.

The only other species is the well-known 'Honesty,' *L. biennis* Mœnch.

ALYSSUM L.

Annuals or low-branching perennials, with hoary or short stellate down and white or yellow flowers. Filaments of the stamens usually winged near the base, or thickened, or furnished with small teeth. Pod sessile within the calyx, orbicular or oval, the partition broad, the valves convex and not veined. Seeds 1–4, or very rarely more.

A large genus extending over Europe and Northern Asia. Distinguished from *Draba* chiefly by the short, few-seeded pod, with more convex valves.

Alyssum Wulfenianum Bernh. (Plate VIII.)

Herbaceous, prostrate and flaccid. From the woody root proceed long, flexuose, simple, or slightly branched shoots, bearing short, dense racemes. Leaves hoary with stellate hairs, obovate or oblanceolate. Flowers bright yellow. Silicule elliptic, at last smooth, somewhat emarginate, twice as long as the style. Seeds 4.

Calcareous debris at about 5500 feet in the Eastern Alps and Carpathians; Alps of Ovir in Carinthia. June, July.

Alyssum montanum L.

Stem diffuse, downy, woody at the base; whole plant greyish green with adpressed, stellate pubescence. Leaves oboval or oblong lanceolate. Flowers bright yellow. Petals emarginate. Longer filaments winged. Silicule circular, swelling in the middle, slightly emarginate. Style equalling the silicule, or shorter. Seeds narrowly winged.

Sandy places and limestone hills 2000–6000 feet. May to July.

Distribution.—Central and Southern Europe, Western Asia, North Africa.

Alyssum cuneifolium Ten.

Densely covered with adpressed, stellate hairs. Stem diffuse, somewhat herbaceous. Leaves obovate-cuneate (i.e. roundly wedge-shaped). Fruit in a corymb. Silicule ovate, somewhat emarginate, about equal to the style.

A greyish green plant with small yellow flowers, and elliptic silicules rounded at both ends, covered with stellate hairs.

Rocks and screes of the high mountains. June to August.

Distribution.—Eastern Pyrenees; Mont Ventoux in France, Northern Italy, e.g. Umbria, Abruzzi and Val Tournanche. In Val Tournanche it has probably descended from the Matterhorn, for it has been found at about 10,000 feet on the Italian side.

Alyssum alpestre L.

Stem somewhat shrubby at base, diffuse, hoary, like the whole plant. Raceme simple, corymbose. Flowers yellow. Petals entire, rounded. Silicules small, obovate-oblong, swelling in the middle. Seeds slightly winged. Plant covered with stellate hairs.

Rocky and sandy places in the mountains, especially in river beds. June to August. Very variable.

Distribution.—Savoy, Dauphiny, Provence, Cevennes, Eastern Pyrenees; Zermatt Valley in Switzerland; Mont Cenis; Southern Europe; Western Asia; North Africa.

Alyssum serpyllifolium Desf. is a small-leaved, pale yellow-flowered and very hoary variety, found at Mont Cenis and in Spain, etc.

Alyssum pyrenaicum Lapeyr.

Stem woody, forming a small dwarf shrub. Leaves oboval or oblong, white tomentose. Flowers white, rather large, sepals loose. Silicules rhomboidal, contracted, pubescent. Style slightly shorter than the silicule. Seed winged.

The only known habitat is the precipitous sides of the calcareous peak called the Soler in the Eastern Pyrenees, where it flowers in June.

Alyssum halimifolium L.

Plant shrubby, 1 foot high, with twisting branches. Leaves oblong obtuse, silvery. Flowers white, large. Petals slightly emarginate, oval. Fruiting-spike a dense corymb. Silicules circular, glabrous, twice as long as the style. Seeds broadly winged.

Limestone rocks in the low mountains of the South. May, June.

Distribution.—Maritime Alps and Dept. of the Var; Liguria, Col di Tenda and Piedmont. Very local.

This very distinct species might be more cultivated in warm places in limy soil on the rockery.

All the rock and Alpine Alyssums are easily grown in light, sandy or other dry soil. *A. saxatile*, from Southern Russia, is the best known species in gardens, where it makes great masses of yellow colour in April and May. None of the Alyssums can have too much sun in summer, or too little damp in winter. Several are very liable to attacks by slugs.

DRABA L

Small annuals or perennials, usually hairy or hoary, with spreading or tufted radical leaves, entire or toothed, with few or no stem-leaves. Flowers white or yellow. Filaments of the stamens without appendages. Pod oblong or elliptical, more or less flattened; the partition broad; the valves flat or convex. Seeds several in each cell. They mostly differ from Alyssum in their longer pod.

A considerable genus, ranging over the northern hemisphere, ascending to the highest elevations and to high Arctic latitudes; and extending along the great mountain chain of America into the southern hemisphere.

Draba aizoides L. (Plate IX.)

Root tapering, branched, putting out persistent shoots which are tufted and cushion-like. Stem erect, 1–3 inches high, simple, glabrous, leafless. Leaves in a radical rosette, linear or linear-lanceolate, acute, entire, ciliated, with long, stiff bristles, otherwise glabrous, thickish, shining. Flowers bright yellow. Petals slightly emarginate. Silicule oval, elliptical, or lanceolate, glabrous or covered with bristles, 3–6 lines long.

Limestone rocks and debris, descending to stony places in the lower hills, as on the Col du Chat near Aix-les-Bains, but most common within the region of *Pinus montanus*. On high Alpine passes and peaks it is generally reduced to a very dwarf size (*D. Zahlbruckneri* Host.). April to July.

Distribution.—Eastern, Central, and Western Alps; Var, Jura, Cevennes, Corbières, Pyrenees, Carpathians. In Britain only on coast of Glamorgan.

Few plants have such a wide range of altitude as *D. aizoides*, for apart from the fact that it grows at sea level in Glamorgan, in the Western Alps alone the writer has observed it from 2000 feet in Savoie to 10,000 feet on the Grands Mulets, etc.

Draba Loiseleurii Boiss.

Resembles *D. aizoides*, but the silicules are rounder, hispid, and not veined, and the style somewhat shorter.

It is peculiar to granitic rocks of high summits in Corsica, and flowers in June.

Draba Sauteri Hoppe. (Plate IX.)

Scape leafless, 1 inch high, with but few flowers. Leaves rather stiff, lanceolate-spathulate, obtuse, ciliate, imbricate. Petals yellow, emarginate, twice as long as calyx. Stamens half as long as the petals. Silicule roundish oval, about as long as its stalk. Style short.

High calcareous Alps; rare. June, July.

Distribution.—On the Watzmann and Tannengebirge, near Salzburg, and elsewhere in the Eastern Alps.

Draba carinthiaca Hoppe (*D. nivalis* DC. = *D. Johannis* Host.). (Plate VIII.)

A slender plant sparsely covered with stellate or simple hairs. Scape 2-leaved; lower part with scattered stellate hairs; upper part and flower-stalks glabrous. Stem-leaves shorter and broader than the lanceolate root-leaves, which form a rosette, are entire or with 1 or 2 teeth; green, but more or less covered with grey hairs, ciliated towards the base with long simple hairs, towards apex with forked and short stellate hairs. Silicule glabrous, longer than the glabrous flower-stalk. Style almost wanting. Named *Johannis* after the Archduke John of Austria.

Rocks and pastures of highest granitic Alps. July, August.

Distribution.—Eastern, Central, and Western Alps, very local; Eastern and Central Pyrenees; Roumania. Found at 9000 feet by the writer at Mont Cenis, in Savoy, and in the Italian Maritime Alps, and by Vaccari at 3760 metres on the Grivola, and 3142 metres on the Becca di Nona (Aosta).

It is not worth cultivating any more than are its close allies *D. Wahlenbergii*, *D. incana*, and *D. tomentosa*, all of which have quite small white flowers. *D. tomentosa* Wahl., however, is more distinct, being densely covered with downy tomentum and the leaves are broader than in *D. carinthiaca* and *D. Wahlenbergii*. It is a granite plant of the Pyrenees, Sierra Nevada, Western Alps, and Carpathians, and was found by the writer on the Aiguille du Goléon in Dauphiny at the unusual height of 11,200 feet or 3414 metres. Also on the Furggengrat near the Théodule Pass at 3400 metres (Vaccari). In cultivation the Drabas are too dwarf to thrive except in suitable ground with sparse vegetation, but most of them would do on old walls and ruins, or on rocks free from coarse or luxuriant growths.

Petrocallis pyrenaica R. Br. (*Draba pyrenaica* L.). (Plate VIII.)

Root tapering, branched, putting out persistent shoots, which are cushion-like and tufted. Stem not more than 1 inch high when the fruit is ripe, simple, leafless, hoary. Leaves in radical rosettes, wedge-shaped, 3–5 cleft, ciliated at the borders. Petals blunt. Flowers large, a lighter or darker lilac, with the odour of vanilla; racemes few-flowered. Silicules oval, glabrous.

Often in large patches. On rocks and debris of the higher Alps, especially on limestone—7000–9000 feet. June to August.

Distribution.—Eastern, Central, and Western Alps; Carpathians; Central and Western Pyrenees. Up to 9100 feet in several places in the Mont Cenis district, sometimes forming pink masses 1 foot across.

It is best grown in pots plunged in sand in the open air, and in frames in winter; but like many other 'Alpines' it becomes drawn and unnatural under glass. On the rockery it does best in sandy loam mixed with broken pieces of limestone, where it can root freely in level, sunny spots. It is increased by seed, or by careful division.

Cochlearia pyrenaica DC.

Stem ascending, angular, 2–4 inches high. Leaves fleshy, glabrous like the whole plant; root-leaves stalked, mostly reniform, cordate, broader than long, entire; the few stem-leaves lanceolate, dentate. Flowers white, very small. Silicules somewhat compressed, elliptical, or nearly globose, as long as the pedicel. Cells 2–4 seeded.

Moist places in the Alps. June, July.

Distribution.—Styria and Pyrenees.

According to Koch it differs from *C. officinalis*, the Common Scurvy Grass, chiefly in having almost all the leaves reniform.

Kernera saxatilis Reichb. (Plate VII.)

Root tapering, with several heads. Stem erect or ascending, 6–12 inches high, glabrous like the leaves, or shortly hairy in lower part, usually branched. Root-leaves in rosettes, obovate-lanceolate (like the stem-leaves), running down into the leaf-stalk, obtuse, entire, dentate or lyrate; upper stem-leaves wedge-shaped or linear-lanceolate, obtuse, entire, sessile, sometimes with small auricles. Flowers milk white. Silicules glabrous, oboval. Style very short, six seeds in two rows.

Common on rocks and stony places in the calcareous Alps and lower Alps, descending to the subalpine valleys. May to August.

Distribution.—Eastern, Central, and Western Alps; Jura, Cevennes, Corbières, Pyrenees; Var; Central and Southern Europe, from Spain to Greece.

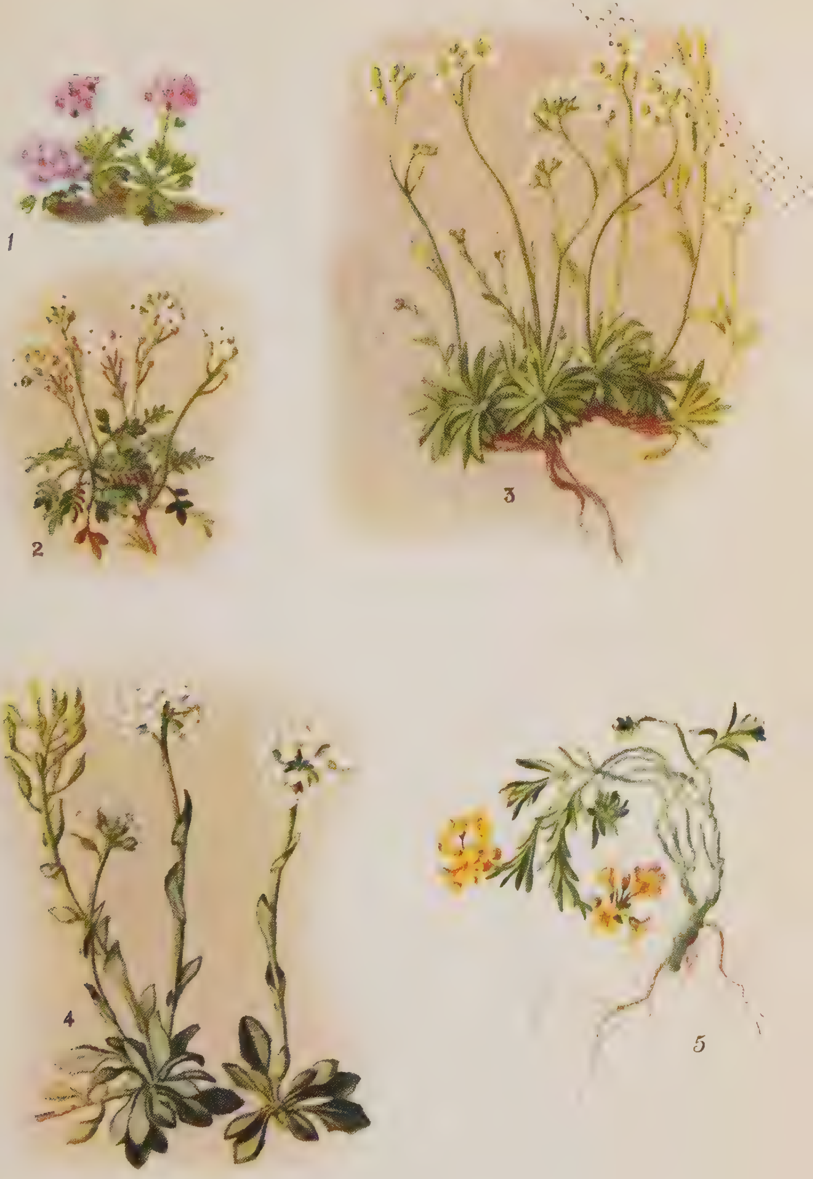

PLATE VIII.

1. Petrocallis pyrenaica R.Br.
2. Hutchinsia alpina R.Br.
3. Draba carinthiaca Hoppe.
4. Thlaspi alpinum Crantz.
5. Alyssum Wulfenianum Bernh.

SISYMBRIUM L.

Annual, or rarely perennial, erect herbs, glabrous or with spreading hairs. Flowers small, yellow or white. Pods linear, nearly cylindrical, the lateral nerves of the valves more or less distinct. Stigma entire, small, or capitate, closely sessile on the summit of the valves. Seeds in a single row, ovoid or oblong, not flattened.

A large genus spread over the northern hemisphere, but containing very few Alpine species.

Sisymbrium pinnatifidum (Lam.) DC. (*Braya pinnatifida* Koch). (Plate VII.)

Stem erect, leafy. Root-leaves forming a rosette, stalked, obovate, dentate, or lyrate; upper leaves sessile, pinnatifid, with 3–4 pairs of linear segments. Terminal segment larger. Flowers white, small. Silicules erect, 4 times longer than the short flower-stalk.

Rocky, sunny places in the higher granitic Alps; at 9000 feet on the Col de Fresse in Savoy. July, August.

Distribution.—Central and Western Alps; Savoy, Dauphiny, Auvergne, Corbières; Pyrenees, Spanish Peninsula, Piedmont, Transylvania, Roumania. In Switzerland only in Valais. Sometimes biennial.

Sisymbrium tanacetifolium L. (*Hugueninia tanacetifolia* (L.) Reich.)

Stem 2 feet high or more, erect, branching at the top, very leafy. Leaves pinnatifid, with numerous lanceolate, incised, dentate lobes, pale green. Flowers yellow, small. Sepals 2–3 times shorter than the pedicel. Fruiting-spikes short, in corymbose panicles, with erect pedicels. Silicules ascending, short, compressed. Valves with 1 nerve. Seeds large, oval, brown, finely spotted.

Pastures and stony places in silicious mountains, especially in the Mountain Alder zone. July, August.

Distribution.—Savoy, Dauphiny, Provence, Central Pyrenees, Spain, Piedmont, as at Mont Cenis. In Switzerland only in Valais.

A useful plant for the shadier parts of the rock-garden among big stones, the foliage being handsome.

Braya alpina Sternb. and Hoppe.

A small plant with many-headed root. Stem 1–3 inches high, simple, cylindrical, with stiff hairs. Leaves linear-lanceolate, broader above, slightly dentate; stem-leaves smaller. Flowers white, in corymbose spikes, violet when dry. Petals twice as long as calyx. Fertile silicules, linear, compressed. July, August.

Distribution.—Near Heilingenblut in Carinthia; on the Solstein near Innsbrück.

Erysimum L.

Erect annuals or perennials, pale or hoary, with closely adpressed hairs, rarely quite glabrous. Leaves entire or slightly toothed. Flowers yellow, or rarely white. Pod linear, nearly quadrangular from the prominent midrib of the valves. Stigma broadly capitate, or with short, spreading lobes. Seed ovoid or oblong, the seed-stalk not flattened.

A rather numerous genus in the northern hemisphere; differing from Wallflower and *Sisymbrium* in the seed-pods.

Erysimum pumilum Gaud.

Root thick. Stem simple, angular, 4–12 inches high. Leaves nearly all radical, numerous, linear-lanceolate, obtuse, entire or sinuate; upper leaves entire, linear, acute. Flowers large, pale yellow, slightly scented; flower-stalks about $\frac{1}{5}$ of calyx. Sepals dilated at the base, 3–4 times longer than the pedicel. Silicules erect, with a short beak.

Rocky, sunny places in the Alps. 6000–9000 feet. July, August.

Distribution.—Alps of Savoy, Dauphiny, and Provence, Piedmont; Carinthia; Eastern and Central Pyrenees. Not noted in Switzerland, though *E. helveticum* closely resembles it.

Erysimum dubium (Suter) Thellung. (*E. ochroleucum* DC.)

Root thick, sending out recumbent, ascending branches. Stem angular, 9–18 inches high. Leaves linear-lanceolate, entire, or slightly toothed. Flowers large, pale yellow, i.e. lemon-yellow-coloured, then straw-coloured, scented. Sepals dilated at the base, 1–3 times longer than the pedicel. Pod compressedly 4-edged; style 3 times width of pod. Stigma 2-lobed.

Rocky places in the Alps. May, June.

Distribution.—Jura, as on the Reculet, Dole, Chasseral, etc., not otherwise in Switzerland; Mont Ventoux; Corbières, Pyrenees, Spanish Peninsula, Carpathians.

Erysimum longifolium DC. (*E. australe* Gay).

A greyish green plant with rootstock sending up erect branches. Stem about a foot high or higher, erect, angular. Leaves linear or linear-lanceolate, entire or sinuate-dentate; stem-leaves numerous. Flowers fairly large, but smaller than in the last, bright yellow. Sepals 1–2 times longer than the pedicel. Pods erect, spreading. Stigma somewhat thick, obtuse. Calyx hoary, yellowish. Hairs simple, adpressed.

Rocky places in the mountains. May to August.

Distribution.—South and south-east of France, Southern and Central Europe.

E. helveticum (Jacq.) DC. is perhaps a Swiss variety only, with larger flowers and longer pods; but it has usually been classed as a species.

In cultivation Erysima are best in sunny places on the rockery; and *E. ochroleucum* is apt to die out on heavy soils. *E. pumilum* has not such vigorous green foliage as *ochroleucum*, and being often very dwarf it is well to protect it by a few small bits of limestone placed in the gritty loam it likes. In fact, it can be wedged tightly between a couple of stones in a hot, dry place. The others do well in ordinary loam in sunny positions.

Matthiola vallesiaca (Gay) Boiss.

Stem erect, very leafy at the base, about 1 foot high. Leaves linear, obtuse, entire, covered with glandular and stellate hairs, lengthened at the base and dilated into a sheath. Flowers reddish violet or mauve. Fruit compressed, tomentose. Stigma bilobed. May to July.

This handsome and very rare plant was only known to grow in the Valais, on the Simplon and about Binn; but Prof. Chodat has found it at Termignon in the Arc Valley, at Susa near Turin, and in the valley of Cogne in the Graian Alps.[1]

Moricandia arvensis DC.

A biennial, glabrous, and glaucous plant. Stem 1½ feet high, erect, branched. Leaves oboval or oblong, entire or toothed, the upper auricled and embracing the stem. Flowers violet, large, veined. Sepals erect, the side pair thickened at the base. Stigma with 2 connivant lobes. Pods spreading, erect, linear-cylindric, slender. Valves with 1 nerve. Beak short. Seeds oval, compressed.

Roadsides, walls, and uncultivated places. April to June.

Distribution.—Maritime Alps; Corsica; Mediterranean Europe and Africa. A conspicuous object on some of the roadside walls between Ventimiglia and La Mortola on the Riviera.

Though not an Alpine plant, it might be introduced on walls and hot, dry places in the rock-garden. It is a handsome and very distinct plant, and probably easily cultivated from seed, and when once established it would seed itself down.

Brassica Richeri Vill.

A perennial glabrous and glaucous Alpine Cabbage. Stem about 1½ feet high, simple. Leaves petioled, oblong or oboval, entire or sinuate; the upper leaves very few and small or none. Flowers yellow, veined, in a dense corymb. Sepals erect or slightly spreading. Fruiting-spike rather long, with short pedicels, erect, spreading. Pods cylindric, compressed, veined. Valves with 3 nerves. Seeds black.

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[1] Chodat and Pampanini. "Sur la distribution des plantes des Alpes Austro-Orientales" in *Le Globe* (Genève), 1902, p. 50.

High pastures and rocks of the Alps; rare. July, August.

Distribution.—Alps of Savoy, Isère, Hautes-Alpes and Basses-Alpes, and Piedmont. It grows on marly slopes at 9200 feet on the Aiguille du Goléon in Hautes-Alpes, France.

It is more interesting than ornamental, and is rarely seen in rock-gardens.

Diplotaxis humilis G. G.

Rootstock with remains of ancient leaves. Stem 3–6 inches, simple. Leaves radical, pinnatifid or nearly entire. Flowers yellow, rather large, 1–8 in a corymb. Sepals erect, as long as the pedicels. Fruiting-spike broad, with spreading pedicels. Pods very broad, stiff, winged. Seeds ovoid, brown, sometimes finely spotted, in one row.

Rocks and bare mountain-sides in the Alps; rather rare. April to August.

Distribution.—Alps of Provence, Dauphiny, and Savoy; south-east of France and Piedmont. Summit of Col du Galibier at 8720 feet, and on marly slope of the Aiguille du Goléon in Dauphiny at 8800 feet.

THLASPI L.

Annuals or low perennials. Leaves usually undivided, the upper ones clasping the stem. Flowers small, white, mauve, or rose. Petals equal or nearly so. Pod orbicular or obovate, flattened laterally at right angles to the narrow partition; the valves boat-shaped, their midrib or keel more or less expanded into a green wing surrounding the pod. Seeds 2 or more in each cell.

A small genus spread over Europe, Northern and Central Asia, and North-West America, distinguished from *Iberis* by having more than 1 seed in each cell of the pod, from all others by the winged pod.

Thlaspi rotundifolium Gaud. (Plate IX.)

Root tapering, putting up elongated aerial branches, loosely tufted. Stem ascending, simple, glabrous like the whole plant; stolons sometimes 2 feet long, penetrating into fissures of rock and among debris. Leaves bluish green, thick, entire, less often slightly toothed, acute or obtuse; root-leaves obovate, narrowed below, crowded into a rosette; stem-leaves ovate, sessile, with a somewhat auricled base. Flowers lilac. Seed-vessel narrowly wedge-shaped, nearly quadrangular, obtuse, very narrowly winged in front, 1–3-seeded.

Debris and wet, shingly places above 6000 feet in calcareous mountains; local. June to August.

Distribution.—Eastern, Central, and Western Alps; Croatia; Transylvania, Roumania.

Thlaspi rotundifolium is more frequently seen above than below

8000 feet, often between 9000 and 10,000 feet, and occasionally still higher. It is abundant on the famous Théodule Pass, and on the Matterhorn ridge, near the hut on the Zermatt side, it grows at about 10,500 feet with *Draba aizoides*, *Cerastium alpinum*, *Campanula cenisia*, *Linaria alpina*, etc. It was one of the few flowering plants observed by the writer at the Grands Mulets, those isolated rocks, just 10,000 feet above the sea, amidst the everlasting snows of Mont Blanc. There it was associated with *Chrysanthemum alpinum* and *Androsace glacialis*.

Thlaspi cepæfolium Koch.

This rare species is very similar to the last, and appears to be confined to the Raiblthal in Carinthia, where it flowers in May.

Thlaspi alpinum Crantz. (Plate VIII.)

Root fusiform. Stem simple, loosely cæspitose, erect or ascending, 2–4 inches high, glabrous like the entire plant. Leaves bluish green, entire or toothed; root-leaves spathulate and forming rosettes; stem-leaves ovate-lanceolate or lanceolate, cordate, amplexicaul. Pods obcordate-lanceolate at base, narrow at apex, $\frac{1}{4}$ inch broad, narrowly winged, pointed at lower end, slightly emarginate at the summit. Style prominent, filiform, 1–4 seeded. Flowers white. Seeds smooth.

Pastures and stony places in the calcareous mountains. June, July.

Distribution.—Eastern and Western Alps. In Switzerland near Zermatt, and possibly in Tessin.

Not to be confused with *T. alpestre* (L.) G. G., which is very similar and grows on limestone hills in Central and Western Europe and in Northern England and in Somerset; nor with *T. montanum* L., which is found in similar places in Central and Southern Europe, but not in Great Britain.

IBERIS L.

Glabrous or minutely downy annuals or branching perennials, with narrow or pinnatifid leaves and white or pink flowers; two adjoining, exterior petals larger than the two others. Filaments without appendages. Pod orbicular or oval, laterally flattened, notched at the top; the valves boat-shaped; the keel or midrib expanded into a wing. One seed only in each cell.

About twenty species inhabiting Southern Europe, Asia Minor, and Algeria, of which several are cultivated under the name of Candytufts, and all readily known by the unequal petals.

Iberis sempervirens L.

Stem 5–10 inches, woody and twisted at the base, diffuse, trailing. Flowering-stems glabrous. Leaves smooth, linear-oblong, obtuse, entire, ciliated, numerous and close together. Flowers white, rather large. Sepals whitish at the borders. Filaments violet at the top. Fruiting-panicle rather loose, with spreading pedicels. Silicules large, oval, broadly winged, each lobe pointed. Style passing beyond the lobes.

Rocks and stony places in the mountains. June to August.

Distribution.—Pyrenees, Corbières, Basses-Alpes; Southern Europe from Portugal to Greece; Asia Minor.

This is the commonest perennial Candytuft, and being half shrubby, dwarf, and evergreen, it is a useful edging for beds or shrubberies, for on any soil it quickly forms low masses of dark green foliage, which in April and May in England change into sheets of white. It loves the sun, and can be increased by seed or from cuttings.

Iberis saxatilis L.

Is very similar, and by some considered only a variety; but the flowering-stems are pubescent, the leaves almost linear, the sepals coloured at the edge (not white), and the silicules are more openly emarginate and the two lobes are rounded at the top; while the style is still shorter than in *I. sempervirens.*

Rocks and limestone hills. May to August.

Distribution.—Jura, east and south of France, Cevennes, Corbières, Spain, Italy, Switzerland.

Iberis Tenoreana DC.

Stem simple, ascending, pubescent, 2–6 inches high. Leaves rather thick, obversely lanceolate, spathulate, dentate at summit. Flowers pink or white. Petals oboval. Fruiting-spike a dense, short corymb. Silicules ovate. Lobes very acute, divergent. Style extending slightly above the top of the lobes.

Rocky hills; scarce. July, August.

Distribution.—Basses and Hautes-Pyrénées, Spain, Portugal, Italy. Not so hardy as the white kinds, and apt to perish on heavy soils; but it is easily raised from seed, and looks pretty on the stony, sandy soil of the rockery.

Iberis spathulata Berg.

A biennial, more or less pubescent; quite dwarf like the last. Stem leafy to the top. Leaves ciliated, entire or slightly toothed, the lower suborbicular, the upper oboval-spathulate. Flowers purplish lilac, rather large. Petals oboval, contracted. Fruit in a very dense, short corymb. Silicules big, suborbicular, broadly truncate at the base, pointed at the top, with a very narrow incision, from which the style projects slightly beyond the tops of the lobes.

Screes and schistose rocks in high mountains; scarce. June to August.

Distribution.—French and Spanish Pyrenees; Italian Maritime Alps.

Iberis Candolleana Jord.

Is another biennial with lilac flowers, glabrous leaves, and large oval silicules, which is found on calcareous mountains only in the south-east of France, viz. the Drôme, Vaucluse, and Alpes-Maritimes. It flowers from June to August.

Iberis gibraltaica L.

Stem woody at base, leafy, notched where the old leaves have fallen, 8–10 inches high, erect, ribbed, smooth like the whole plant, rarely branching at the top. Leaves leathery, green, subsessile, spathulate, with rounded and irregularly toothed summit. Flowers in rounded umbels, lilac, numerous. Pedicels 10–15 mm. long. Silicules inflated, large (10 mm.), circular, emarginate, with longish style. May.

Rocks at Gibraltar.

This beautiful species, larger than most of the others, should be planted in sunny places on the rockery or in light soil, and wintered in a frame. It does not often ripen seeds in this country, and can be increased by cuttings.

There are various other perennial or biennial species of *Iberis* growing in the Pyrenees and in hot places in the south, such as *I. Bernardiana* (peculiar to the Pyrenees), *I. intermedia*, *I. ciliata*, and *I. linifolia*, which might be tried in gardens as much as some of those described.

The above remarks on *Iberis* also apply to *Aethionema*, an allied genus of about 40 species inhabiting Southern Europe, North Africa, and Western Asia. Several are now cultivated in this country, and some have pretty pink flowers. They require deep soil in a sunny position, and resent being disturbed. The commonest is—

Aethionema saxatile R. Br.

Root tapering, branched, with many heads. Stem ascending, often curved and prostrate, almost woody at the base, 8–12 inches high, simple or branched, glabrous and glaucous like the whole plant, very leafy. Leaves leathery, shortly petioled, entire, the lower ones obovate, almost sessile, the upper lanceolate-acute. Sessile sepals with 3 nerves. Flowers white, mauve, or flesh-coloured. Fruiting-spike elongated, with spreading pedicels. Silicules rounded at the base, emarginate at top, with 2 many-seeded cells. Style shorter than the lobes. Leaves often have a violet tinge.

Rocky places and debris in the mountains and sub-Alps, especially on limestone, often descending to a low elevation. April to June.

Distribution.—Jura, East and South of France, Switzerland (rather rare), Cevennes; Corbières, Pyrenees, Carpathians, Southern and Central Europe; Algeria, Asia Minor.

More a Mediterranean than an Alpine plant.

Biscutella lævigata L. (Plate IX.)

Root tapering, branched, tufted, with many heads. Stem erect, branched, glabrous or with stiff hairs on the lower part. Leaves very variable, entire, or more or less dentate, acute, generally hairy, dark green, shining, the lowest leaves lanceolate and narrowed into a foot-stalk, the upper lanceolate or linear, sessile, with rounded semi-amplexicaule base. Flowers yellow, fragrant. Silicules of 2 circular, flattened lobes, with winged, membranous border. Style about as long as the diameter of the lobe.

A polymorphic plant, generally considered Alpine, for it is very frequent in the Alps up to 8000 feet; but it is also found in uncultivated and rocky places throughout Central and Southern Europe from Belgium to Portugal and Roumania. May to August.

There are only about 5 species of *Biscutella*, all characterised by the peculiar circular silicules and long style; but we believe *B. lævigata* is the only perennial example of the genus, e.g. *B. cichoriifolia* Lois. is a handsome annual of hispid growth and wavy leaves embracing the stem, which is often seen in waste or rocky places in the south of Europe.

Hutchinsia alpina (L.) R. Br. (*Noccœa alpina* Reich.). (Plate VIII.)

Stem simple, ascending or recumbent, leafy at the base, 1–4 inches high, slender, sometimes pubescent. Leaves glabrous, pinnate, with small oval or oblong lobes. Flowers pure white, rather large for the plant. Petals oboval, twice the length of the calyx. Raceme long and loose when in fruit, with spreading, erect pedicels equalling the silicules. Silicules elliptical, acute at both ends. Style short, with 2 seeds in each cell.

Damp, stony, and often shady places in the Alps; common, especially on limestone. May to August. Sometimes carried long distances by Alpine torrents, in the sandy beds of which its roots penetrate far.

Distribution.—Eastern, Central, and Western Alps, Jura, Pyrenees, Carpathians.

Often found up to 9000 and 10,000 feet; but the higher, stunted form of the primary rocks is sometimes (as by Schroeter) called *H. brevicaulis* Hoppe, and is distinguished by its more compact growth, its shorter raceme of fruits, the absence of a style, and its petals being narrow wedge-shaped; while in *alpina* they are suddenly contracted at the base. Dr. Schroeter gives its range in the Alps of the Valais of Grisons as from 2400–3300 metres. I have myself found this variety in several places in the Western Alps of France and Piedmont from 2800–2990 metres. Prof. Vaccari has

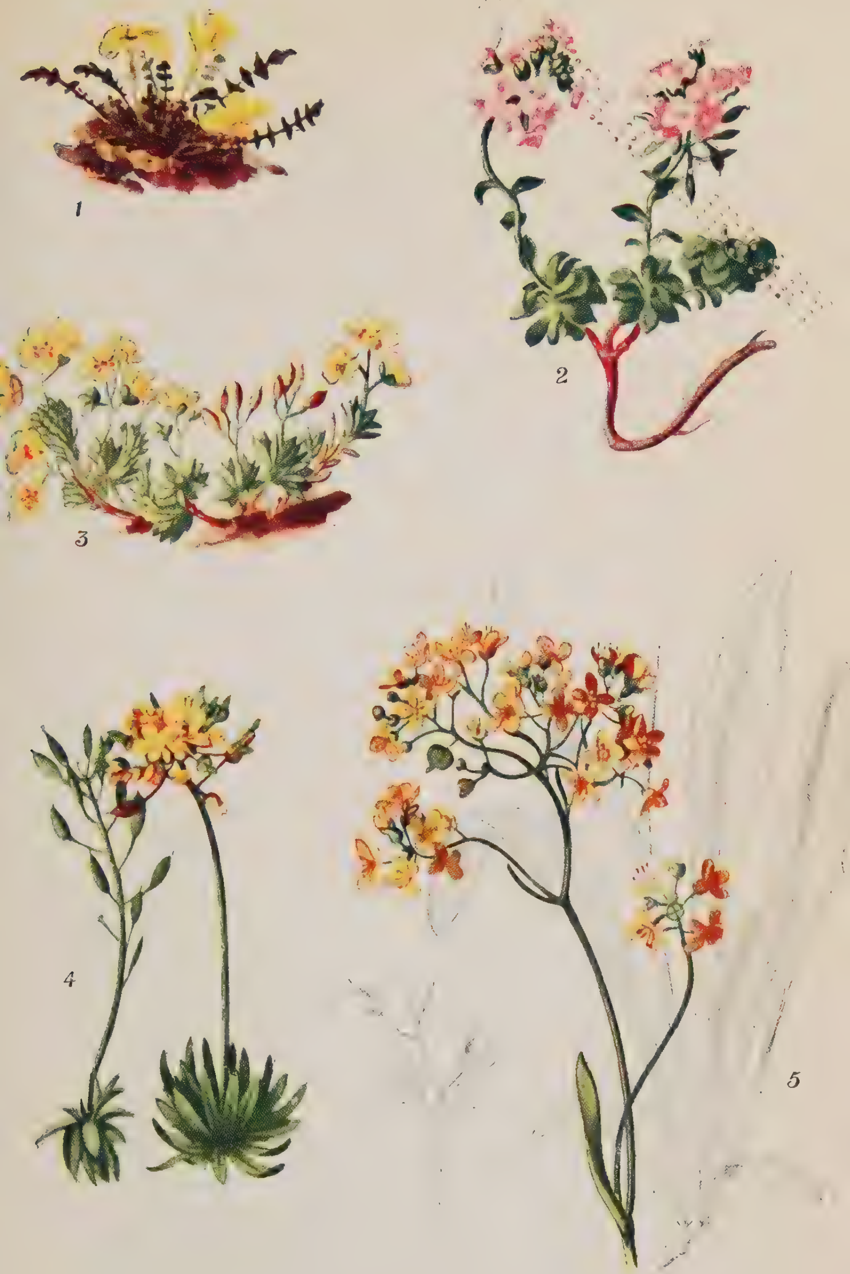

PLATE IX.

1. Morisia hypogœa Gay.
2. Thlaspi rotundifolium Gaud.
3. Draba Sauteri Hoppe.
4. Draba aïzoides L.
5. Biscutella lævigata L.

recorded it from 3390–3760 metres on the Grivola in the Graian Alps, which is the highest record for the plant.

Hutchinsia alpina is easily cultivated in deep, sandy soil on the rockwork; but, like many other Alpines, it must have plenty of water in the spring, for in nature it gets this from the melting snows. It can be increased by division or from seed.

Morisia hypogœa Gay. (Plate IX.)

Root thick, vertical. Stem wanting or very short. Leaves forming a radical rosette, pinnate, with triangular lobes, dark green, shining. Flowers yellow, very large for the size of the plant, which is usually about 4 inches across. Sepals erect. Flowering-stems springing from the rootstock, and when fruiting turning down into the soil. Silicule leathery, in 2 divisions, the upper globular with 1 erect seed, the lower oval-compressed with 2 cells and several hanging seeds. Style conical.

Sands and rocks in Corsica and Sardinia; endemic. November to June.

In English gardens this interesting little plant flowers from February to May, and it does best in a light, gritty soil, and seeds itself. If collected, the seed should be sown directly it is ripe. It was introduced into this country some years ago by a lady visiting Turin Botanic Gardens from seeds given her by Prof. Moris, who found the plant in Sardinia, and in whose honour it is named.

CISTACEÆ

Flowers fugacious, usually large. Sepals usually 3. Petals usually 5. Stamens numerous. Ovary usually 1-celled, with 3 parietal placentæ, style 1, stigmas 3. Herbs or shrubs, often fragrant and resinous.

Helianthemum L.

Sepals 3–5, the 2 outer usually smaller. Petals 5, crumpled in the bud. Ovules numerous. Style jointed at the base. Stigma capitate or 3-lobed. Leaves opposite.

About 35 species chiefly spread over Southern and Western Europe and North Africa, with a few in America.

Helianthemum alpestre Dunal. (Plate X.)

Shrubby, about 6 inches high. Stem procumbent, branches ascending. Leaves opposite, stalked, lanceolate, narrowed at the base, more or less hairy, without stipules. Racemes loose, bracteate. Petals golden yellow, twice as long as the calyx. Calyx erect on the fruiting distant flower-stalks. Style as long as the ovary.

Stony Alpine and subalpine pastures, especially on limestone, up to 8200 feet. June to August.

Distribution.—Alps, Apennines, Southern France, Spain, and Portugal.

Helianthemum canum Baumg. (Plate X.)

A rather shrubby, prostrate plant covered with silk hairs, especially on the younger leaves, which are elliptical, sometimes silver-white on the upper side and covered with a grey felt on the under side. Flowers small, yellow. Racemes numerous and short, with small bracts at the base of the pedicels.

Stony, hilly districts, especially in the forest region. May to August.

Distribution.—Central, Western, and South-western Europe from Southern Sweden to Spain. In Switzerland only on the Jura frontier. On limestone rocks rarely in North-western England and Ireland, Isle of Arran.

Helianthemum grandiflorum DC.

Perhaps only a large-flowered variety of *H. vulgare*, which is so polymorphic. Flowers up to 26 mm. in diameter; solitary, or in twos or threes.

Dry Alpine pastures up to 7400 feet. June to August.

The distribution of this variety has not been well marked, but it is particularly fine at Mont Cenis and in Savoy.

There are various other species from Spain and the Mediterranean which are well worth growing in the rock garden, but none of this genus are strictly Alpine plants, though they mostly grow on rocks. Among the more beautiful are *H. polifolium*, which is covered with white tomentum, and grows so luxuriantly at Brean Down in Somerset; *H. tuberaria* is very distinct and has no woody branches, but is herbaceous; both leaves and flowers are large. It grows in Pine woods in the south and particularly in the islands of the Mediterranean, both large and small.

The Rock Roses are of the easiest culture in almost any light, rather poor soil fully exposed to the sun; and they strike readily from cuttings. If cut back after flowering they tend to grow more compact. The hybrids are very numerous and many of them extremely beautiful, being in all shades of yellow, salmon-pink, rose, and crimson. Few plants are of greater value for the rockery, for in addition to their beauty they grow very quickly. The nomenclature, however, of this genus seems somewhat confused. The tendency to hybridise may partly account for this.

VIOLACEÆ

A family represented in Europe by a single genus.

Viola L.

Leaves radical or alternate, stipulate. Flowers axillary, solitary, or in cymes, with 2 small bracts. Sepals 5, usually unequal, and produced at the base beyond their insertion. Corolla irregular,

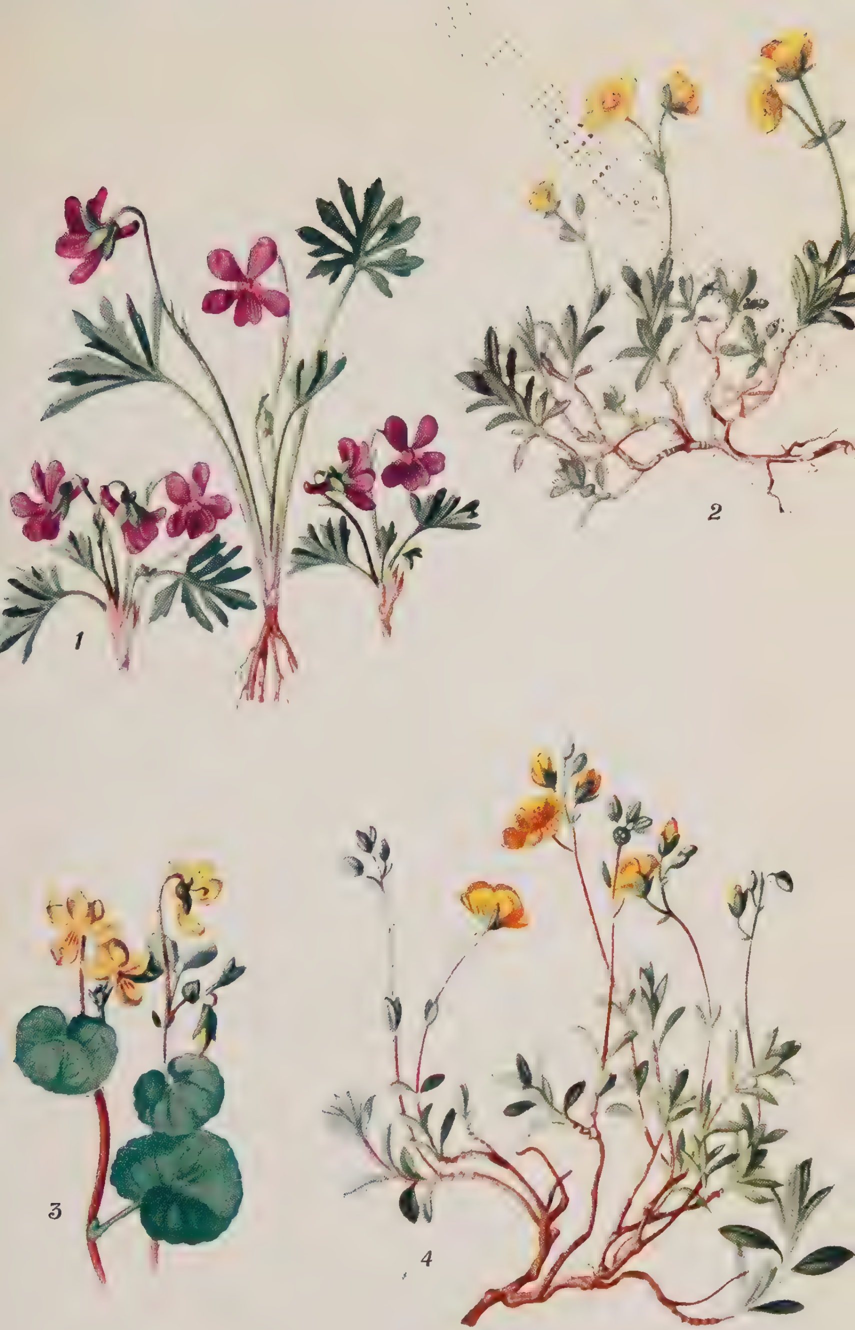

PLATE X.

1. Viola pinnata L.
2 Helianthemum alpestre Rchb.
3. Viola biflora L.
4. Helianthemum canum Baumg.

[illegible]

of 5 spreading petals, the lowest produced into a spur at the base. Style single, with a dilated or thickened or hooked stigma. Capsule 1-celled, 3-valved. Seeds attached to 3 parietal placentæ.

There are about 150 species of Viola spread more or less throughout the globe.

Viola pinnata L. (Plate X.)

Plant glabrous. Leaves all radical, digitate, multi-partite, with obtuse teeth. Flowers pale violet or blue, rarely white, fragrant. Petals small. Capsule trigonous.

Stony, rocky places in the Alps from 4500–7000 feet, blossoming as soon as the snow has melted. June, July.

Distribution.—Eastern, Central, and Western Alps, local; rare in Switzerland and commoner in Carinthia and Tyrol; Ural Mountains, Siberia.

Viola biflora L. (Plate X.)

Rootstock cylindrical, scaly, fleshy, oblique, branched above. Stem erect or ascending, limp, glabrous like the flowers and leaf-stalks. Leaves reniform, crenate, obtuse or shortly acuminate, finely ciliated, otherwise mostly glabrous, bright green. Stipules ovate-lanceolate, acute, entire. Flowers usually 2 in a leaf-axil. Petals yellow, the odd one streaked with brown at the base. Calyx-teeth acute. Stigma abrupt and hollow, somewhat 2-lobed. Capsule elongated, obtuse, glabrous, pendent.

Bushy, stony places and damp rocks and in moist mountain woods; 4000–9000 feet, though rarely above 8000 feet. June to August.

Distribution.—Throughout the Alpine chain; Carpathians, Scandinavia, Jura, Corsica, Pyrenees; Asia from the Urals and Caucasus to India; North America.

Easily grown in a deep loam with plenty of leaf-mould, and thrives in half shade, especially among damp boulders and under dripping rocks or in shallow caves.

Viola calcarata L. (Plate XI.)

Leaves crenate, ovate, the upper ones lanceolate. Stipules entire, tripartite or pinnatifid. Stem 1-flowered, erect, 3 inches or more in height. Flowers about an inch in diameter, usually violet-blue, rarely yellow, or white; spur as long as corolla, i.e. at least ¾ inch and so long and narrow that only butterflies with a sufficiently long proboscis can penetrate as far as the nectar at its extremity. Plant glabrous, branched and leafy at the base, with creeping runners.

Alpine pastures from 6000–9000 feet, often so abundant as to form a carpet of violet-blue. June, July.

Distribution.—Eastern, Central, and Western Alps, Jura, Apennines, Central and Southern Europe from Bavaria to Sicily and Greece.

Hermann Mueller, to whom we owe most of our knowledge of the fertilisation of Alpine flowers, observed that in the Alps nine different butterflies visited no less than 194 flowers of this violet in 6¾ minutes. Plate XVI in *La Flore Alpine* by Correvon and Robert (1909) gives a beautiful series of *V. calcarata* in all shapes and colours.

Viola lutea Hudson. (Plate XI.)

Stem usually simple, ascending, leafy. Leaves crenate, the lower ones ovate-cordate or ovate-lanceolate, upper ones lanceolate. Stipules palmate-multifid, with linear or linear-oblong lobes. Spur scarcely longer than the auricles of the sepals. Flowers yellow, more rarely violet or yellow and violet.

Alpine and subalpine pastures (limestone and schist) up to 7500 feet. May to July.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps; rare in the Pyrenees. (British.)

Viola alpina L. (Plate XI.)

Rootstock cylindrical, knotted, branched above and not putting up any stolons. Leaves radical, ovate or cordate, crenate, acute, glabrous or slightly hairy, not increasing in size with age, shining. Stipules lanceolate, acute, entire or toothed, connate with the leaf-stalk to above the middle. Flower-stalk 1–3 inches long, springing from the crown of the root, erect in fruit. Sepals acute or obtuse. Flowers large, violet-azure, scentless. Stigma hollow, cup-shaped. Capsule ovate, glabrous, nodding.

Rocky pastures in the calcareous Alps, in and above the region of *Pinus Mughus*. June, July.

Distribution.—Carpathians, Eastern Alps.

Viola valderia All.

Stem 6–10 inches high, spreading. Leaves small, the lower broadly ovate, the upper oblong or elliptic-lanceolate, mostly entire. Stipules multifid, with 2–7 unequal lobes. Flowers rather large, usually pale violet, but variable. 'The lateral and lower petals have a pencilled purple dash and beard at their junction, which gives intelligence to the expression of the soft lavender flowers, with their delicate golden eye' (Reginald Farrer in *Gardeners' Chronicle*, July 25th, 1910). Flowers longly petioled. Sepals lanceolate, acute. Capsule oval, pointed, equally the calyx. 'Its foliage, thoroughly villous, is of a greener colouring than *V. cenisia*, otherwise the plants are very close together' (Farrer, *l.c.*).

Sandy, stony slopes and screes at 4000–5000 feet; rare. April to July.

Distribution.—Peculiar to a few places in the French and Italian Maritime Alps, and the mountains of Liguria on the east side of the Col di Tenda. The writer's observations in Liguria, e.g. on Monte Toraggio, where *V. valderia* ascends to 5000 feet, corresponded with those of Mr. Farrer a few miles further west. Bicknell says: 'It is of more branching habit than *V. calcarata*, with often many flowers on one stem, and usually smaller; the peduncles are widely outspread; the leaves mostly entire and always more or less crenate or dentate.'[1]

Mr. Farrer thinks this rare treasure may be amenable to moraine culture, and we trust it may.

Dr. Briquet points out that this is one of the very local plants endemic on the crystalline rocks of the Maritime Alps, which have probably resisted glacial times by finding excellent means of existence on the grits.[2]

Viola cenisia L.

Roots rampant, often penetrating far into shingle. Stem 2–6 inches high, slender, naked at the base, diffuse. Leaves small, the lower broadly oval or heart-shaped, the upper ovate-lanceolate, much larger than the lower leaves, more or less entire. Stipules entire, resembling leaves but smaller, and often furnished with 1–2 little lateral lobes near the base; flowers pale, slaty violet, rather large, on rather short peduncles. Sepals ovate-lanceolate. Capsule slightly extending beyond the calyx.

Calcareous screes and stony places in the high Alps just below the snow-level, usually from 8000–9000 feet. June to August.

Distribution.—Local in Switzerland, Savoy, Dauphiny, Provence, Eastern and Central Pyrenees; Spain, Piedmont, Tyrol (?), Albania.

This also should succeed best as a moraine plant. It is a plant which hardly ever descends below its high normal range, like *Saxifraga biflora, Ranunculus glacialis, Campanula cenisia, Androsace glacialis*, etc.; while some high growers such as *Linaria alpina, Draba aizoides, Saxifraga oppositifolia* often get carried down into the valleys many thousands of feet.

Viola nummularifolia Vill.

A dwarf plant with small suborbicular leaves shorter than the petioles. Stipules lanceolate, undivided, remotely serrate. Sepals oblong-lanceolate, acute. Stem very short and blunt. Small pale violet flowers on longish peduncles. Capsule subglobular, pointed, rather shorter than the calyx.

Rocky pastures in the Alpine region; rare. July to September.

Distribution.—French and Italian Maritime Alps; Corsica.

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[1] *Flora of Bordighera and San Remo* (1896), p. 32.

[2] *Le Développement des flores dans les Alpes Occidentales* (1906), p. 150.

Viola cornuta L.

Root fibrous. Stem ascending, leafy. Leaves rounded, crenate, ciliate ; upper leaves oval-cordate or truncate at the base. Stipules large, obliquely cordate, incised-dentate, ciliate. Sepals subulate. Spur subulate, longer than the calyx. Capsule obtuse.

Pastures in the Alpine and subalpine region ; local. June to August.

Distribution.—Pyrenees, Spain, Haute Savoie (Grammont), Apennines.

Among Violas of recent introduction into this country is *V. gracilis* Sibth., from Mount Olympus and elsewhere in Greece. It produces elegant deep purple blossoms in spring, and is hardy in light soil.

Nearly all the Violas are so easily grown that any remarks upon their culture are unnecessary. Moist, sandy soil suits most of them, and they can be easily increased by cuttings from robust, short runners. The peculiar positions preferred by *V. biflora* have already been noticed.

POLYGALACEÆ

A family represented in Europe only by *Polygala* itself. The other genera being chiefly tropical and differ from *Polygala* in the form of the fruit, or in minor details in the structure of their flowers.

Polygala Linn.

Herbs or shrubs, with entire leaves, usually alternate, no stipules and very irregular flowers in terminal racemes. Sepals 5, of which the two inner are larger, usually petal-like and commonly called wings. Petals 3, 4, or 5, the lowest very small and subulate, and all more or less united with the stamens. Stamens united in two parcels. Style 1, with a single stigma. Ovary and capsule flat, 2-celled, with a single pendulous seed in each cell.

A numerous genus, widely spread over most parts of the globe. Some of the showy South African species are often cultivated in our greenhouses.

Polygala Chamæbuxus L. (Plate XI.)

Stem shrubby, creeping, branched. Branches prostrate or ascending, glabrous like the whole plant. Leaves narrowly lanceolate or elliptical, entire, mucronate, the lower ones smaller, obovate. Flowers solitary or in pairs, terminal or in the axils of the leaves. Corolla with a small 4-lobed crest, as long as or shorter than the wing-sepals, which are ovate, oblique, erect or recurved, nerveless, with branched veins. Wings pale yellow before fertilisation, often red, brownish or purple later. Corolla-tube deep yellow, but purplish after fertilisation.

Woods and rocky or grassy places in the mountains, extending

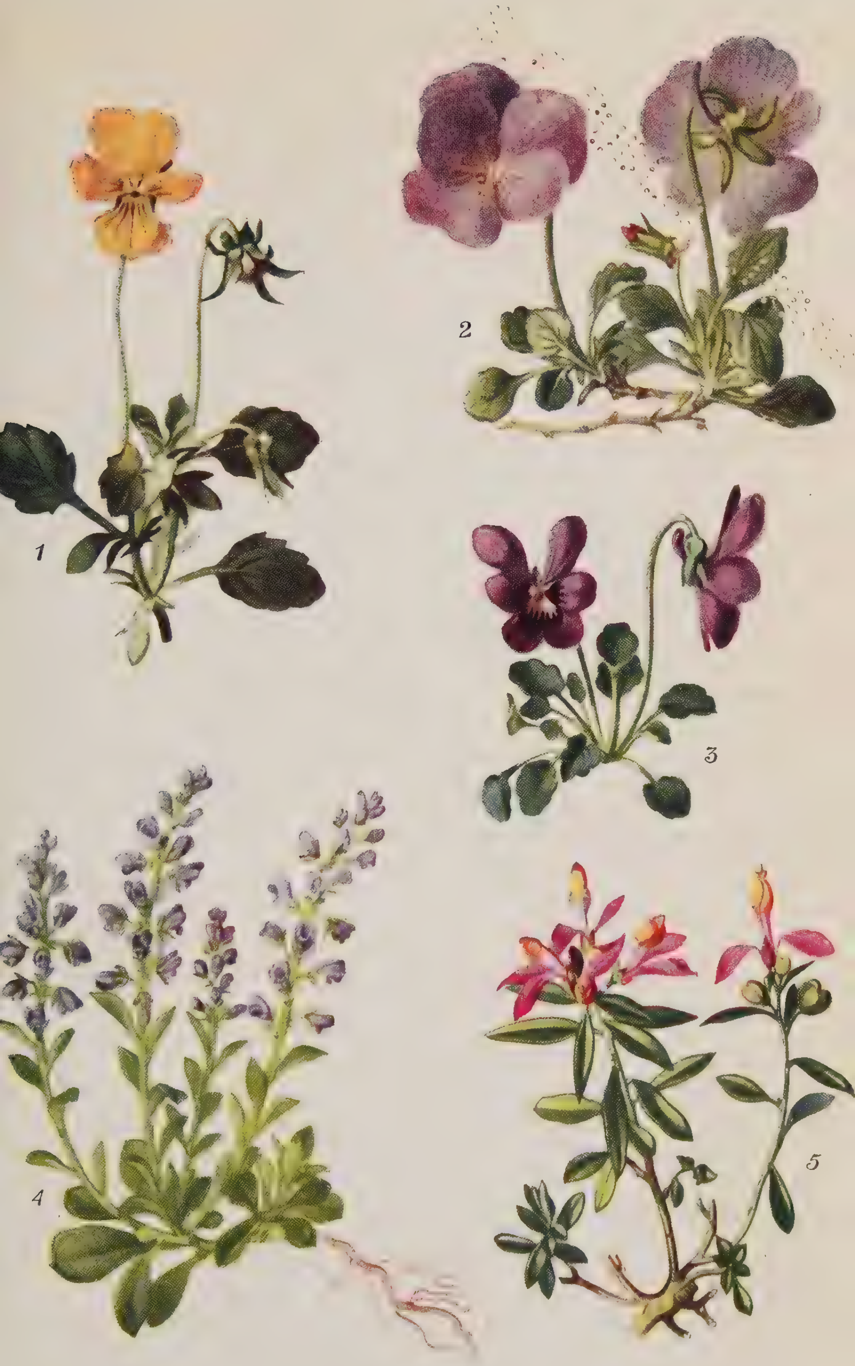

PLATE XI.

1. Viola lutea Hudson.
2. Viola calcarata L.
3. Viola alpina Jacq.
4. Polygala alpestris Rchb.
5. Polygala Chamæbuxus L.

up to the Alpine region, where it is usually dwarfer and more floriferous. Very common. A difficult plant to get up by the long, slender roots, for they penetrate long distances, and yet there is little of them to survive a journey to this country. May to July.

Distribution.—Central Europe from the Eastern Pyrenees to Roumania.

This evergreen creeping shrub likes a shady place in sandy peat and loam or in good leaf-mould, and can be increased when well established by careful division.

Some of the books on gardening and Alpine plants speak of a variety *purpurea*, and the ordinary plant being cream-coloured. Probably this so-called variety is merely due to fertilisation ; and in any case *P. Chamæbuxus* is a variable plant, and when growing in the shade of woods the flowers are not only paler in colour, but much less numerous than when growing on the open mountain-side.

Polygala alpestris Reichb. (Plate XI.)

Stems numerous, woody, filiform, spreading, ascending. Lower leaves short, broadly ovate, often forming a rosette ; upper leaves longer, clothing the lower part of the panicle. Flowers small, pale blue. Wings of calyx ovate, as broad as and longer than the capsule.

Alpine and subalpine pastures, especially on limestone. June, July.

Distribution.—Juras, Central and Western Alps, including Piedmont.

This species is not much understood, and is often confused with *P. alpina* Perr et Song. *P. alpestris* may perhaps be a form of *P. amara* L., and it is synonymous with *P. amarella* Crantz, var. *alpestris* Borbas.

Prof. Chodat of Geneva has compiled a monograph upon this difficult genus.

For the rock-garden there are other more beautiful species than the above, which, though not Alpine, are more worthy a place on rockeries. *P. nicæensis* Risso, a Mediterranean plant extending into the Maritime Alps up to 2000 feet, has handsome purple flowers. The Common Milkwort, *P. vulgaris* L., with flowers of blue, rose, purple, or white, attains a remarkable size in the mountains, and is well worth more attention in our gardens, for it will grow anywhere, and is very pretty.

CARYOPHYLLACEÆ

Annual or perennial herbs, with opposite, entire leaves and no stipules, except in a few genera which have small, scarious stipules ; the branches usually knotted at each pair of leaves. Flowers frequently in dichotomous cymes or panicles. Sepals 4 or 5, free or united into a tubular calyx. Petals 4 or 5, twisted in the bud, sometimes minute. Stamens free, inserted under the ovary. Styles

2 to 5, linear, stigmatic along their whole length. Capsule 1-celled or divided into cells at the base only, opening at the top into twice as many teeth as there are styles. Ovules numerous.

A large family widely spread over the globe, and very numerous in temperate regions, especially in the northern hemisphere, extending into the Arctic circle and to the summits of the Alps. The genera into which species are distributed are often very artificial, depending on the number of sepals, petals, stamens, or styles. As these numbers are not strictly constant, even in different flowers of the same species, care must be taken in some of the small flowered *Alsineæ* to count the parts of several flowers, if hesitation be felt as to the genus it should be referred to.

DIANTHUS L.

Stiff perennials, or more rarely annuals, with narrow leaves. Calyx tubular-campanulate, 5-toothed, with 2–6 imbricating scales at the base. Petals usually crenate, or jagged. Stamens 10. Styles 2. Capsule stalked within the calyx, opening at the top in 4 teeth or short valves.

A large genus, spread over Europe and Asia, with a few in South Africa.

Dianthus alpinus L. (Plate XII.)

Stem 3 inches high, erect or ascending, glabrous, like the leaves, simple, smooth, or rough at the margin. Scales 2–4, herbaceous, glabrous, subulate, as long as or shorter than the calyx-tube. Flowers large, 1½ inches across, flesh-coloured or rose above, with a ring at the base of the corolla spotted with carmine and white, greenish white below. Petals triangularly obovate-cordate, undivided, but jagged at the base.

High Alpine pastures. June to August.

Distribution.—Carpathians and Eastern Alps. Not in Switzerland, nor in the French or Italian Alps.

A half-shaded place in a light soil with limestone chips suits it best; and it requires plenty of water when growing and frequent top-dressing. Mr. W. A. Clark recommends 'a south aspect sheltered from the noonday sun. Good fibrous loam and grit, with a little leaf-mould—two parts loam, one leaf-mould, one grit. A top-dressing of leaf-mould and sand should be worked among the young growths once or twice a year. They do not root into the ground as some species do. They should be lifted carefully up, and the dressing put under each shoot, taking care first to leave out the tip.'

Dianthus glacialis Haenke. (Plate XII.)

Stem with one or more pairs of leaves near to one another, often very short, forming a dense cushion. Leaves linear-lanceolate,

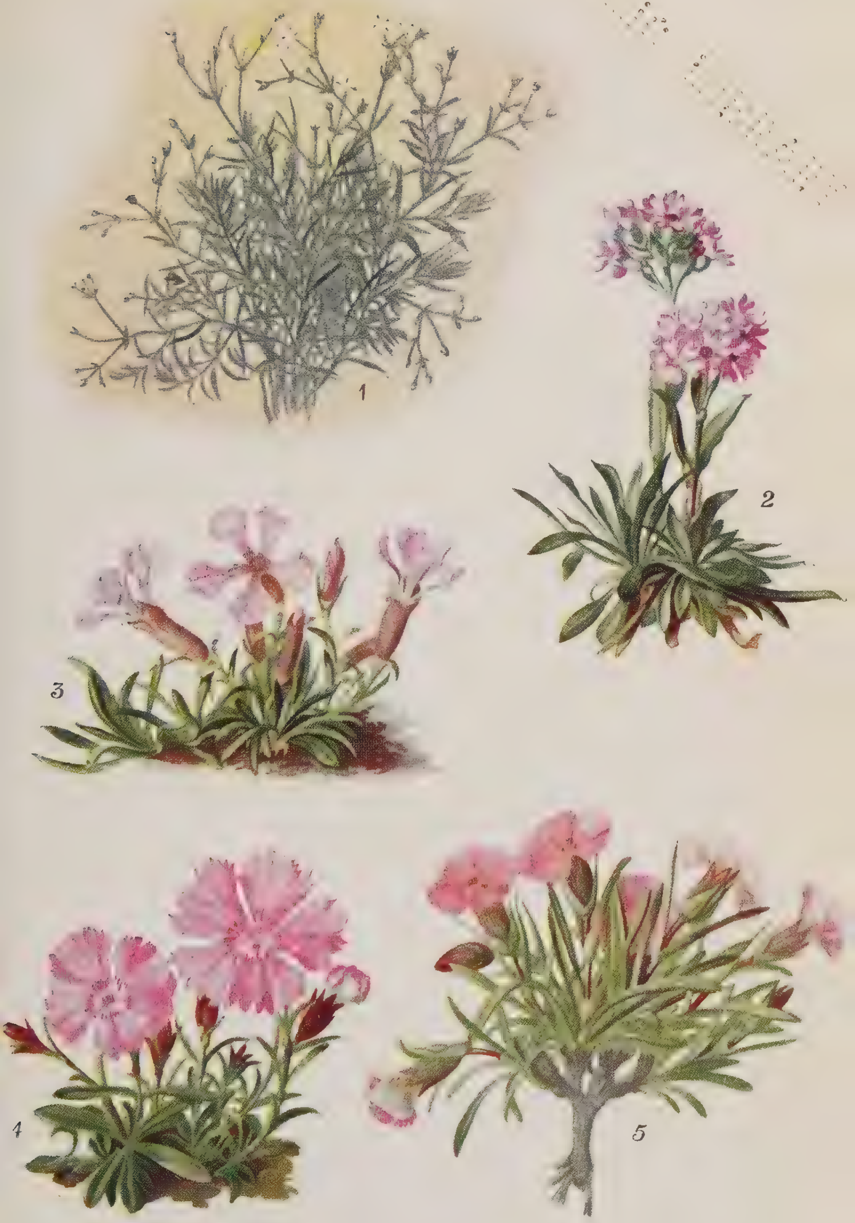

PLATE XII.

1. Moehringia muscosa L.
2. Lychnis alpina L.
3. Silene Pumilio Wulf.
4. Dianthus alpinus L.

obtuse, narrowed toward the base, with glabrous margin, somewhat fleshy, shining, 1-nerved. Scales 4, the two outer ones herbaceous at the apex, leaf-like, slightly reflexed, longer than the calyx-tube, all with a white membranous margin. Flowers rose-red, rarely white, fragrant. Lamina of petals bearded, half as long as calyx-tube.

High granitic Alps—rare—7000–8500 feet. July, August.

Distribution.—Carpathians, Eastern and Central Alps. In Switzerland rare, and only in Grisons.

This little Pink is difficult to grow, but may be tried in rock crevices in half-shade, with plenty of granite chips mixed with peaty soil or leaf-mould. It much dislikes lime. William A. Clark said in 1901: 'No doubt a really good clump of this would be hard to find. I find it grows best in a south-west aspect on a sloping bank, with a compost of loam, leaf-mould, and sand; just enough sand should be added to keep the soil open. The plant should be dressed once or twice a year, or as often as the soil washes away from it. Put the dressing carefully among the young growths, and in the autumn the top-dressing should be composed nearly all of grit, with the fine sifted out, so that it will absorb any moisture that may rest on or near the plant during the damp season, November and December being the worst months. A sharp look-out must be kept for snails in the spring, as they are particularly fond of this species.'

Dianthus subacaulis Vill.

This small species is well suited to the rockery, and especially on limestone, like the Cheddar Pink, but it does not seem known in this country. The root is woody, and it sends up tufts of short, rough, linear leaves. Stem angular, simple, from 2–6 inches high. Flowers rose, rather small, solitary; scales of the calyx broad, short ($\frac{1}{3}$ to $\frac{1}{2}$ the length of the calyx), and with short point. Calyx short, striated above, with ovate teeth. Petals entire or crenate. Capsule conical. A variable species.

Rocks and rocky pastures, especially on limestone. May to August.

Distribution.—Alps of Dauphiny and Provence, Cevennes, Eastern Pyrenees, Spain.

Dianthus neglectus Lois.

Glabrous, forming tufts of grass-like leaves. Stem 2–8 inches high, according to situation and elevation, simple, angular. Leaves narrow linear, with 3 nerves. Flowers bright rosy pink above, buff-coloured below, solitary, or rarely in pairs at the top of the stem. Scales of the calyx ovate-lanceolate, very pointed, equalling the calyx, which is short, cylindric, striated throughout its length, with ovate-cuspidate teeth. Capsule cylindrical.

Pastures in the Alps from 6000 to 8000 feet; local. July, August.

At Mont Cenis, where it is abundant, it varies in form from 6 or 8 inches high in the meadows by the Lake to an almost stemless plant at 7000 and 8000 feet, but the flowers, which are always exquisite, do not seem to vary much in size or colour.

Distribution.—Western Alps, from Piedmont and the Maritime Alps to Savoy, Lombardy, Tyrol, Eastern Pyrenees. Not at all in Switzerland.

⚑ Mr. L. B. Meredith may well call this 'the gem of the genus.' He says it comes readily from seed, though by this means the colour of the blooms is apt to vary somewhat as to shade. The same gentleman says it is of the easiest culture in light, sandy loam and lime, in sun.

Dianthus Seguieri Vill.

Glabrous, forming tufts of leaves. Stem 12–18 inches high, branching, angular. Leaves linear, flat. Flowers pink, with a purple circle round the centre, in heads of 2–4. Scales long, striated, with erect spreading point, equally the tube of the calyx. Calyx rather long, striated throughout, with sharp, lanceolate teeth. Petals hairy at the throat, deeply toothed. Capsule cylindric.

Dry places in the mountains; local. June to August.

Distribution.—Western Alps, Eastern Pyrenees, Central Europe, and Western Asia. Only in transalpine Switzerland. Not strictly Alpine, this species can be seen in bushy places at the summit of La Superga, the wonderful hill, close to Turin. It loves the sun.

Dianthus furcatus Balb.

Glabrous. Stem 5–9 inches high, angular. Leaves soft, the lower ones short and broadly linear, obtuse, with 3–5 nerves, the stem-leaves longer and pointed. Scales 4, erect, the lower 2 herbaceous, oval, the point reaching half the length of the calyx. Calyx rather short, 13–16 mm., narrow, striated throughout its length, teeth lanceolate-acuminate. Petals glabrous, entire or toothed. Flowers pink or whitish, 1–3 at the top of the stem, longly stalked. Capsule cylindric, extending slightly beyond the calyx.

Rocks and dry pastures in the Southern Alps; rare. June to August.

Distribution.—Maritime Alps, as in Val Miniera, Liguria, Piedmont; Hautes-Alpes and Basses-Alpes.

This species is quite distinct, and, though not particularly striking, is worth trying in rock-gardens, where it ought to grow in light, sandy loam, in a sunny position.

Dianthus silvestris Wulf.

Considered by some a sub-species of *D. Caryophyllus* L., which is not Alpine, but grows on rocks and walls in Southern Europe, and in Algeria and Morocco. *D. silvestris* is a dwarfer plant, more tufted, with 2 small scales to the calyx, and a slight scent. The flowers are bright pink and rather large, and usually in panicles of 1–3 on longish peduncles. The leaves are narrow, linear, acute, pale green or glaucous. A polymorphic plant.

Steep hill-sides and rocks in the mountains, and sometimes in open woods; common. It attains 7500 feet, and descends to the plains. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Corsica; Pyrenees, Central and Southern Europe.

It should have an open, sunny position in dry, stony loam, or in rock crevices with plenty of soil.

Dianthus glaucus Huds. (*D. cæsius* Sm.). Cheddar Pink.

This Pink is so well known as not to require any description here, and moreover it is *not* Alpine, and is never found in the Alpine zone, but in rocky places in the sub-Alps and hills of Central Europe. It is mentioned because so frequently seen in English rockeries and on garden walls, where, with the help of lime, it will form huge patches in course of years.

Dianthus superbus L.

Not an Alpine, though sometimes seen in meadows above 6000 feet, as between St. Moritz and Pontresina. Stem 18 inches high, rounded, branched above. Leaves linear-lanceolate, soft, but rough at edges, the inferior sub-obtuse, the superior acute. Scales oval, mucronate, ¼ or ⅓ length of calyx-tube, purple-red. Petals large, slit, and fringed, pink or lilac, with reddish hairs and green spots at the base; rarely white, scented.

Woods and damp meadows from the plains up to 6500 feet. June to September.

Distribution.—Central and Southern Europe, Western Asia, Japan.

D. superbus does not live very long, and is generally treated as a biennial. It requires deep, peaty soil, or a mixture of sand and leaf-mould.

D. speciosus Reichb. is a rare Alpine variety found in meadows in Southern Switzerland and Tyrol from 5000 to 7500 feet.

Dianthus monspessulanus L.

This belongs to the same group as *superbus*, and may be treated in a similar way, though it grows in drier places. The variety *alpicola* Koch (*D. alpestris* Sternb. and Hoppe) has 1-flowered stems. It is found locally in meadows in Southern Tyrol and Carinthia, at from 1600–2400 metres.

D. monspessulanus L. is a native of Southern Europe.

Dianthus Carthusianorum L.

Stem about a foot high or higher, simple. Leaves linear, acute, the stem-leaves with a long sheath. Flowers a deep red, subsessile, 2–8 in a dense panicle, surrounded with coriaceous bracts. Scales of calyx scarious, the point reaching the centre of the calyx-tube. Calyx dark purple. Petals obovate, hairy at the throat, toothed. Capsule cylindrical.

Arid, stony, and bushy places in the Alps and plains, up to 7000 or 8000 feet in the Alps. June to September.

Distribution.—Central and Southern Europe, but rare in the Mediterranean region.

A very variable plant with several named varieties, such as *atrorubens*, *vaginatus*, etc.

There are many other species of *Dianthus* which could be, and some of which are, sometimes grown on rockeries, such as *D. deltoides*, *D. silvaticus*, *D. Requienii* (Pyrenees), etc.; but the object of this work is only to describe the more noticeable and interesting of the Alpine flowers, and a few of the rock plants which cannot be considered Alpine, though often treated in England as such. Moreover, the culture of most of those mentioned is more or less the same. A frequent top-dressing is the chief desideratum, and those who desire to cultivate mountain species can be guided by the cultural remarks to be found under *D. alpina* and *D. glacialis*.

A *Monograph of the Genus Dianthus* was published in 1893 by Mr. F. N. Williams, who has worked so much at various genera in this family. He had previously published *Notes on the Pinks of Central and Western Europe*.

TUNICA Scop.

A small genus closely allied to *Dianthus*, from which it is not always separated; but the calyx is pentagonous, and the corolla has no corona.

Tunica saxifraga Scop. (*Dianthus saxifragus* L.)

Stem with spreading branches, glabrous, 6–8 inches high, slender. Leaves linear, acute. Corolla pale rose, veined, sometimes white, small, solitary. Calyx bell-shaped, with 5 angles. Capsules ovoid.

Arid places from France to Eastern Europe, and in Western Asia as far as Persia. In the Alps it extends up to 1800 metres. It has lately appeared in Pembrokeshire, but cannot be considered native there.

Dianthus prolifer, which is an annual, was considered a *Tunica* by Scopoli.

T. saxifraga can easily be raised from seed, and will grow almost anywhere in dry, sunny places.

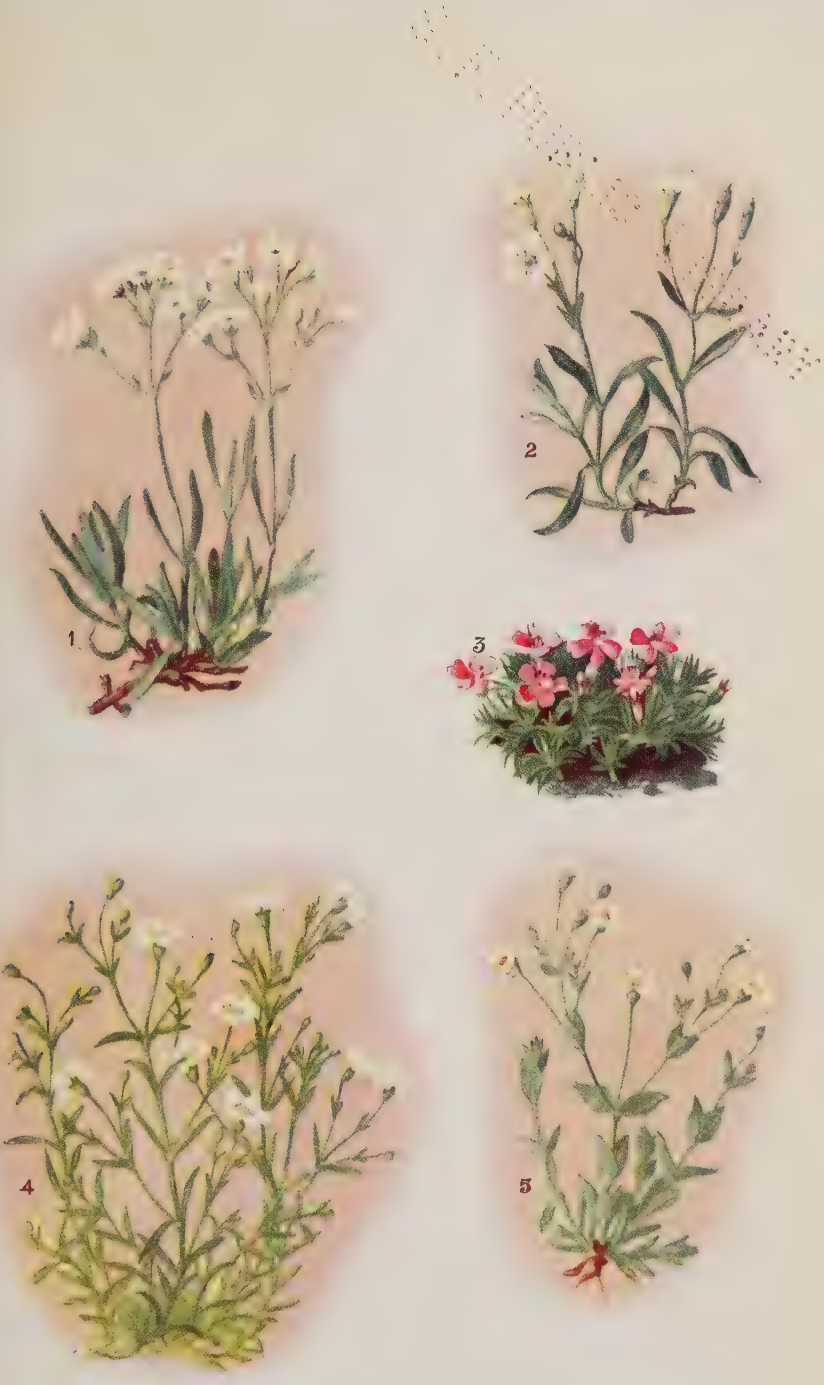

PLATE XIII.

1. Gypsophila repens L.

3. Silene acaulis L.

[illegible]

GYPSOPHILA L.

Calyx short, campanulate, pentagonal, without scales at the base. 5 Petals, gradually narrowed to the base, without a corona. Styles 2. Stamens 10. Capsule with 1 cell and numerous seeds.

About 55 species inhabiting Europe and Asia.

Gypsophila repens L. (Plate XIII.)

Root tapering, branched. Stem 3–6 inches high, erect or ascending, simple or branched above, glabrous like the leaves. Leaves linear-lanceolate or linear, entire, acute, bluish green, moderately thick. Flowers in loose paniculate cymes. Petals 2–3 lines long, white or pale rose-coloured, more or less emarginate. Calyx bell-shaped, 5-cleft. Teeth lanceolate, membranous at the margin, 1-nerved, straight, obtuse, with a short mucro. Capsule subglobular, obtuse, with a very short carpophore.

Dry, rocky, and gravelly places in the calcareous Alps and sub-Alps, 3000–8000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, from Savoy to Roumania, and the Carpathians, Central Pyrenees, Jura, Poland, Germany. Very easily grown in dry, sunny places, and increased by layers or from seed. It quickly forms mats of dense foliage and flowering spikes, and hence is very suitable for covering ugly rocks, etc.

SAPONARIA L.

Calyx tubular, 5-toothed, without scales at the base. Petals with a corona. Disc small. Styles 2. Ovary 2-celled at the base. Capsule 4-valved.

This genus, artificially distinguished by the number of styles, as Bentham says, comprises several European and West Asiatic species.

Saponaria ocymoides L.

Stem trailing. Plant hairy, glandular at the top. Leaves broadly lanceolate or oblong, ciliated, with 1 nerve. Flowers bright rose (sometimes paler and rarely white), shortly stalked, in panicles. Calyx cylindric, hairy, glandular, with 15–20 nerves, and obtuse teeth, often very red. Capsule oval, 4 times the length of the glabrous carpophore.

Stony places and limestone rocks in full sun. May to July. In the Alps it extends up to 7800 feet, but it is by no means a purely Alpine plant, being, e.g., found over the greater portion of hilly France.

Distribution.—Central and Southern Europe, from the Iberian peninsula to Bavaria and Carinthia; Corsica, Sardinia. Of very easy culture in sunny positions in deep, loamy soil. Being such a good trailer, it is best to plant it so that it will fall over and decorate a rock or bank.

Saponaria lutea L.

A small tufted plant, glabrous below, hairy above, with woody rootstock. Stems 2–4 inches high, erect, simple, somewhat leafy. Root-leaves in a rosette, linear, acute, flat, with 1 nerve. Flowers a dirty yellow, violet at the base, subsessile, in a dense head. Calyx oblong, woolly, with rounded, mucronate teeth. Petals oboval, entire. Stamens with black filaments. Capsule oblong, with short carpophore.

Dry, grassy places and on rocks; rare. July, August.

Distribution.—Alps of Savoy, on the frontier, near Mont Cenis, and especially on the Mont Cenis plateau on the Italian side, where it grows from 5500 to 7000 feet. Also recorded from Lombardy. In Switzerland only from Tessin, where it is very rare.

It is not very hardy in this country, and is more interesting and rare than beautiful.

Saponaria cæspitosa DC.

Of similar habit to the last, but rather taller, and with larger flowers, which are bright rose and subsessile. The filaments are whitish, and the leaves keeled at the back.

Rocky mountain sides in the French and Spanish Pyrenees. July, August.

This pretty little plant is fairly hardy, and sometimes succeeds in light, sandy soil. Top-dressing with grit would be appreciated by both these dwarf species of *Saponaria*.

LYCHNIS L.

Calyx tubular or inflated, with 5 teeth. Petals 5, with erect claws and a spreading lamina, entire or 2-cleft. Stamens 10. Styles 5, or very rarely 4. Capsule 1-celled, or divided at the base into 5 cells, and opening in 5 or 10 teeth or short valves at the top.

About 40 species widely spread over the northern hemisphere without the tropics.

Lychnis alpina L. (Plate XII.)

Rootstock many-headed, prostrate or creeping, putting out, in addition to the flower-stalk, rosettes of leaves lying close to the ground. Stem 2–6 inches high, single, glabrous, not viscid. Leaves narrow lanceolate, pointed, glabrous. Flowers in a terminal umbellate cyme, pink. Petals deeply bifid, with 2 hooks instead of teeth at the base of the lamina. Capsule ovoid.

Grassy and rocky mountain sides on the primary and siliceous rocks, from 7500 to 9000 feet; very local. July, August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Arctic and Northern Europe and Asia, and North America. Very rare in Britain. Not recorded from Switzerland.

Easily propagated from seed, and grown in rather moist, sandy loam.

Lychnis viscaria L.

Stems 6 inches to a foot high, glabrous, very viscid in the upper part. Leaves long and narrow, resembling those of the last species. Flowers red, in close, sessile, or shortly-stalked opposite clusters, forming an oblong panicle or head. Calyx tubular, with 10 veins and 5 short teeth. Petals slightly notched.

Rocks and hilly pastures. May to July.

Distribution.—Central and Northern Europe; Siberia; Caucasus; a few places in North Wales and Scotland.

This is not an Alpine plant, nor is it 'Arctic,' though found in a large part of Asiatic Russia. But in any case it is an attractive subject for the rockery, where it is frequently seen, for it grows easily in a sandy soil.

Lychnis Flos-Jovis Desr., with its leaves covered with a grey felt and ragged red flowers, is occasionally seen in mountainous districts up to 4000 feet.

L. Coronaria L, with its thick white felted leaves and large red flowers, also sometimes attains a considerable height in the Italian Alps, as in Val Tournanche. It is an old favourite in cottage gardens. It is rarely found in Switzerland, and only in the Valais.

SILENE L.

Calyx, corolla, and stamens as in *Lychnis*. Styles 3. Capsules opening at the top in 6 teeth or short valves. A very large genus of about 250 species, widely spread over Europe, Central and Northern Asia, and North America, with a few species in South Africa.

Silene acaulis L. (Plate XIII.)

Usually stemless, or with stems ½ to 1 inch high. Root woody, branched, with many aerial shoots, covered with the withered leaves, and bearing a rosette of fresh leaves forming dense, cushion-like tufts. Sometimes hemispherical masses a foot across are seen covering rocks or grassy ground in Alpine pastures. Leaves radical, linear, acute or acuminate, entire, shortly ciliated, otherwise glabrous. Flowers diœcious or hermaphrodite, solitary at the extremity of the shoots. Calyx cylindrical, or bell-shaped, with 10 nerves and ovate, obtuse teeth. Petals obovate-lanceolate, rose-coloured, slightly emarginate.

Rocks and pastures in the Alps. Common, especially on limestone, 5000–11,000 feet. May to July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees, British Isles, Arctic Europe, Asia, and America, Iceland; Spitzbergen.

Var. *exscapa* DC. (*S. exscapa* All.)

Calyx narrowed into the flower-stalk. Petals lighter pink. Carpels oval, scarcely exceeding the calyx.

A stemless, small form of the above found on slaty soil at from 6500 to 11,000 feet (3600 metres on Monte Rosa), less common than the type.

Var. *elongata* DC. (*S. elongata* Bellardi.)

A little known form with longer stems (6 cms.), rather larger flowers, and a looser habit, so that it spreads as a loose mat over the surface, and hangs from the crevices of rocks in rather shady places.

Distribution (based only on the writer's experience).—Mont Cenis, 7000 feet. Several places in the Tarentaise in Savoy, as on the Col de la Leisse at 8000 to 8500 feet, Dauphiny, as at Lautaret and the Col du Galibier (8500 feet); Simplon.

Mr. R. Paulson has an interesting note on *Silene elongata* in the *Journal of Botany*, December, 1907, where he has transcribed the original Italian description of Bellardi (1788). Vaccari, who records it from Gressoney la Trinité, says it extends as far East as the Simplon.

Silene acaulis is indispensable for the rockery, though it is often a shy bloomer in this country. It should have all the sun it can get, and a poor soil with plenty of grit, otherwise it will make too much soft green growth during the summer, which gets cut off on the arrival of winter. It may be wedged between stones in crevices of rocks.

Silene pumilio L. (Plate XII.)

Stem much branched, scarcely 2 inches high, forming large cushions. Leaves rather fleshy, grass-green, linear, obtuse, narrowed below. Flowers solitary, terminal, very handsome, sessile, rose-red, afterwards brownish red from the pollen. Lamina of petals undivided, obovate, very slightly emarginate, with a bristly corona. Calyx inflated, elongated, cup-shaped, net-veined, many-nerved, rough-haired. Calyx-teeth ovate, obtuse.

Moist, rocky places from 6000 to 8800 feet. July, August.

Distribution.—Carpathians, Eastern Alps. Not in Switzerland.

This and the next species, *S. Elizabethæ*, require a sunny place tightly wedged between stones, and with a good depth of soil fo the long tap root. They can be propagated from seed.

Silene Elizabethæ Jan.

Rootstock densely covered with leaves. Stem simple, ascending 3–6 inches high, finely glandular, hairy above. Root-leaves lanceolate, acute, narrowed at the base. Stem-leaves ovate-lanceolate Flowers 1–3, terminal, very large and handsome, bright pink

Lamina of petals obcordate, fan-shaped, cut, and toothed. Calyx 5-cleft.

Alpine pastures on limestone, 4000–5000 feet; rare. June, July.

Distribution.—South-West Tyrol, Val Vestino.

Silene alpestris Jacq. (Plate XIII.)

Root tapering, branched, with woody shoots, tufted. Stems erect or ascending, 6–12 inches high, stiff, glabrous, or with scattered hairs, dichotomously branched above, and viscid at upper part, like the flower-stalks. Leaves lanceolate, acute, or obtuse, thick, entire, ciliated near the base, otherwise glabrous, connate. Lower leaves narrowed into a foot-stalk. Flowers in a terminal loose, few-flowered cyme, white or pinkish. Petals 4–5 toothed. Corona acutely toothed. Calyx finely glandular, downy, or rough, erect, not changed when fruit is ripe. Calyx teeth ovate, obtuse. Capsule twice as long as calyx, 1-celled, dehiscent, with twice as many teeth as styles. Seeds reniform, compressed, surrounded at edge by a radiate, 4-nerved crest of linear scales.

Abundant in the calcareous Alps and lower Alps, 3000–6000 feet, often descending into the valleys with debris. May to August.

Distribution.—Carpathians, Eastern Alps (Tyrol to Carinthia).

Silene Saxifraga L. (Plate XIV.)

Root tapering, branched, tufted, with woody shoots. Stem prostrate or ascending, swollen at the nodes, 4–6 inches high, grass-green like the leaves, usually simple, finely downy or glabrous above, 1–2 flowered, rarely more. Leaves narrowly linear, acute, entire, rough at the edge, sessile, with narrowed connate bases. Calyx turbinate, 10-nerved, glabrous, erect, pale green or brownish, calyx-teeth ovate or obtuse. Flowers white or pink within, greenish red without. Petals 2-cleft. Corona scale-like.

Stony places and debris on the calcareous lower Alps; local. Up to 6600 feet in Valais.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Var, Pyrenees, S. Europe.

In cultivation there must be lime in the soil, and it should have plenty of sun.

Silene quadrifida L. (*Heliosperma quadrifidum* (L.) Reichb.). (Plate XIII.)

Root with fusiform branches, and tufts of procumbent, slender, brittle stems. Stems 2–6 inches high, viscid above, glabrous, or with a few scattered hairs, dichotomously branched above. Leaves narrowly linear, acute, entire, ciliated at the base, slightly connate, the lowermost gradually narrowed into the leaf-stalk. Flowers in a terminal, loose, few-flowered cyme, white. Petals 4-toothed. Corona sharply dentate. Calyx glabrous, erect. Teeth ovate, obtuse, unchanged when fruit is ripe. Capsule as long as calyx.

A very slender little plant growing in shaded, moist limestone rocks and cliffs in the Alps, from 3500 to 7600 feet. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Central and Western Pyrenees, from Spain to Macedonia. Very rarely seen in Alpine gardens, for it wants moisture in half-shade of limestone rocks. It grows at 7600 feet, at the foot of the cliffs at the summit of the Tournette in Savoy, a curious isolated mass of carboniferous limestone overlooking the beautiful Lake of Annecy, a mountain where many interesting Alpine plants can be found at a comparatively low elevation.

Silene pudibunda Hoffmegg. is the var. β (of Koch) of *S. quadrifida*. The leaves are broader, and the petals are pink. It is a local plant of the primary rocks from 1000 to 2000 metres (Dalla Torre).

Silene rupestris L. (Plate XIII.)

Stem dichotomously branched, ascending, and often erect, glabrous and glaucous, like the whole plant. Leaves ovate, acute, sessile, the lower ones lanceolate, narrowed at the base. Flowers milk-white or rose-coloured. Petals emarginate, almost twice as long as the calyx.

Rocky Alpine and subalpine situations, preferring siliceous to calcareous rocks. Up to 8000 feet at Mont Cenis, occasionally found at 9000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps; Corsica; Pyrenees, Vosges, Cevennes, Spain, Lapland, Scandinavia, Altai.

Easily propagated and grown from seed, like many of the genus, but dislikes lime, and, on the contrary, should have plenty of grit or granite chips.

Silene Schafta Gmel.

Is a hardy species from the Caucasus, often grown in English rock-gardens, on account of its brilliant rose-coloured blossoms. It forms neat tufts about 6 inches high, and can be grown from seed or by the division of well-established clumps. It is a late-flowering kind, the cultivated tufts often being thickly covered with flowers from July to September.

Silene vallesia L.

A robust but dwarf pubescent, glandular species. Stems 4–6 inches high, 1–3-flowered, leafy. Leaves lanceolate, acute. Stem-leaves sessile, root-leaves narrowed into a petiole. Calyx tubular, glandular, with lanceolate teeth. Petals bifid, pinkish white above, crimson underneath. Capsule pubescent, and equalling the glabrous carpophore in length.

Stony places on siliceous rocks, very local. July, August.

Distribution.—In Switzerland only on some of the Southern Alps in Valais, on the Italian frontier; Alps of Savoy and Dauphiny (as at La Grave), Italy, Dalmatia, Bosnia, Montenegro, etc.

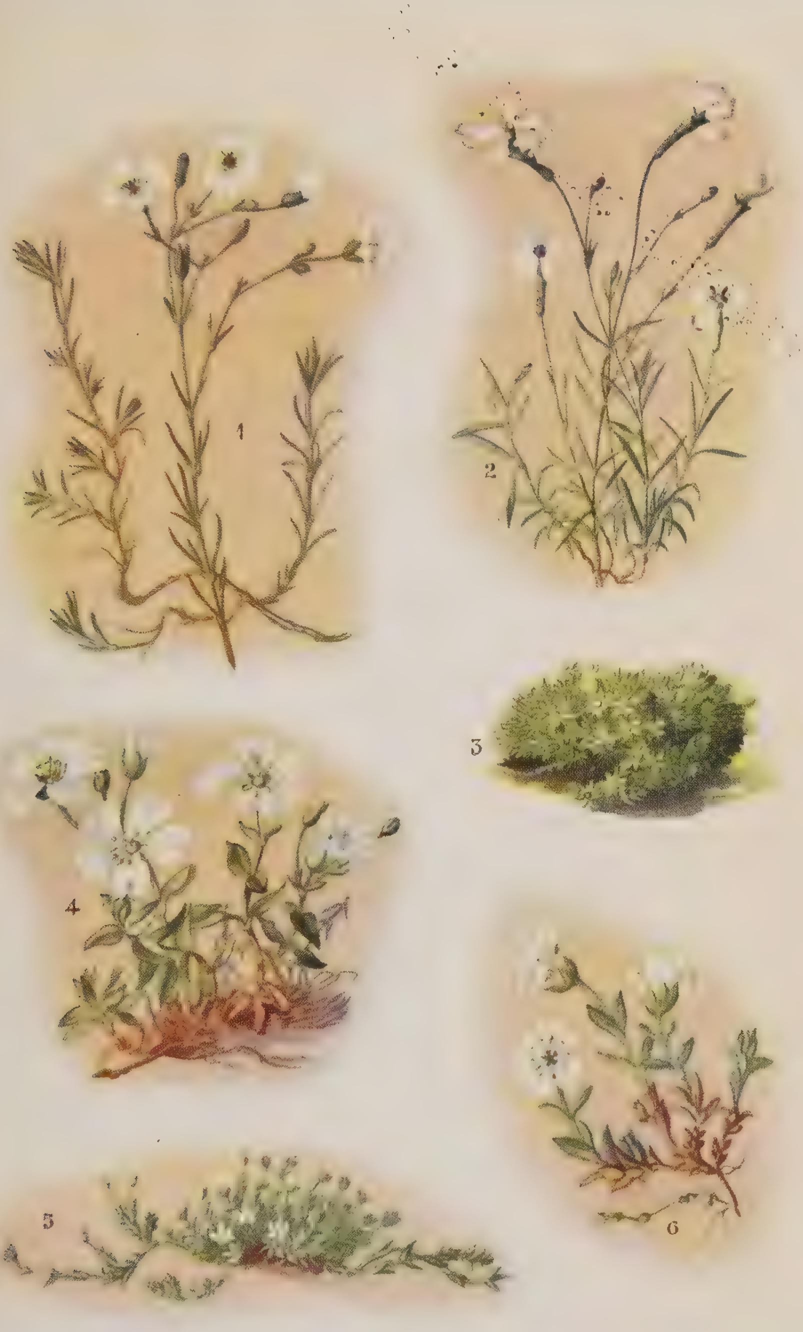

PLATE XIV.

1. Alsine laricifolia Crantz.
2. Silene Saxifraga L.
3. Cherleria sedoides L.
4. Cerastium latifolium L.
5. Alsine lanceolata M. et K.
6. Cerastium uniflorum Murith.
(C. glaciale Gaud.)

This little-known plant is worth introducing into gardens, and may be treated much as *S. rupestris.*

Silene nutans L. is frequently found in the Alps at a considerable elevation on the siliceous and primary rocks, and might well be grown on the rockery, as an example of a different group of taller *Silenes* with drooping flowers. We found the var. *spathulæfolia* Burnat, at just 8000 feet, near La Grave in Dauphiny.

A *Revision of the Genus Silene* was written by Mr. F. N. Williams, and published in 1896.

CERASTIUM L.

Small herbs, usually hairy or downy, and often viscid, branching at the base, with white flowers in terminal forked cymes or rarely solitary. The upper bracts often, like the sepals, scarious at the edges. Sepals 5, rarely 4. Petals 5, rarely 4, usually 2-cleft, sometimes minute or wanting. Stamens 10, or occasionally 5 or fewer. Styles 5, rarely 4 or 3. Capsule opening at the top in twice as many short teeth as there are styles.

A rather large genus, spread over the globe, but most numerous in the temperate regions, and specially of the northern hemisphere.

Cerastium arvense L.

Stem perennial and much branched at the base, and frequently prostrate and creeping, ascending to about 6 inches high. Leaves crowded in lower parts, narrow, linear lanceolate, glabrescent. Flowers large and white, in loose cymes, on rather long pedicels. Petals twice the length of the sepals, cleft to the middle. Capsule oblique, usually longer than the calyx.

Dry hilly fields, pastures, and banks, extending from the lowlands of England to 8700 feet in the Alps, and often mistaken there for *C. alpinum.* May to July.

Distribution.—Europe, Russian Asia, North America, Andes of South America, Morocco.

There are several Alpine varieties, the commonest of which is *strictum* Haenke (*alpicolúm* Fenzl.), which is smaller, very thickset, and with narrower leaves and smaller flowers. We have gathered it at 9000 feet on the Aiguille du Goléon in Dauphiny and the Col de la Leisse in Savoy.

Cerastium alpínum L. (Plate XV.)

The same height as *C. arvense*, but of a greyish green colour; the sterile shoots in a rosette, the flower-stems ascending, tomentose, with long, soft, woolly hairs, with or without glands, lower bracts often entirely herbaceous and resembling leaves. Leaves oblong lanceolate, obtuse or acuminate, and always broader than in *C. arvense.* Petals rather longer and deeply bifid. Capsule nearly straight, scarcely exceeding the calyx.

Moist pastures and stony places in the High Alps (up to 10,000 feet), chiefly on granite. July, August.

Distribution.—Mountain ranges of Europe, Russian Asia, and all round the Arctic circle. Highlands of Scotland. Rare in Wales. Rarer in the Alps than the next two species. *C. lanatum* is probably only a particularly woolly form of this species. (See below.)

Cerastium uniflorum Murith. (*C. glaciale* Gaudin.) (Plate XIV.)

Stem slender-branched, 1–2 inches long, forming loose cushions. Leaves more or less crowded, short with soft hairs, light green. Flower-stalk terminal, as long as or longer than the flower, with fine spreading hairs. Sepals ovate-lanceolate, rather obtuse, with a narrow membranous margin. Petals obtuse, cleft to about the middle. Capsule longer than the calyx, nearly cylindrical. Flowers solitary, rather large.

On debris of high siliceous Alps up to 11,500 feet. July, August.

Distribution.—Eastern, Central, and Western Alps. Some botanists consider this only a variety of the next species.

Cerastium latifolium L. (Plate XIV.)

Rootstock fusiform, cæspitose. Stem 2–4 inches high, prostrate or ascending, simple, covered, like the whole plant, with hairs, which are more or less glandular-viscid. Leaves ovate-elliptical, often very large, entire, sessile, sometimes glabrescent, and without glands, as in the figure. Flowers very large, bell-shaped, pure white, in a terminal 1–3 flowered cyme. Petals nearly obcordate, patent, twice as long as the calyx. Bracts without any membranous margin, resembling stem-leaves in form and hairiness. Calyx-teeth hairy, with dry membranous margin. Styles 5. Flower-stalk 2–4 times as long as calyx, patent or horizontal after flowering, at length again erect. Capsule splitting with 10 teeth. Seeds obtusely and reticulately warty, testa surrounding the albumen loosely.

Stony places and loose debris on the highest Alps, especially on limestone, from 7000 to 10,000 feet. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Caucasus.

Bentham says 'the *C. latifolium* figured in *Eng. Bot.*, tab. 473, is the *C. lanatum* of some foreign botanists. The *C. lanatum* of the Alps of Central Europe is not a British plant.' The stems of *C. latifolium* sometimes penetrate a foot or two through shingly debris, and the straggling plant often covers a large area.

All the Alpine *Cerastia* enumerated can be propagated from seed, when obtainable, and grown in gritty soil without any lime. When once established they can be increased by division or by cuttings after flowering.

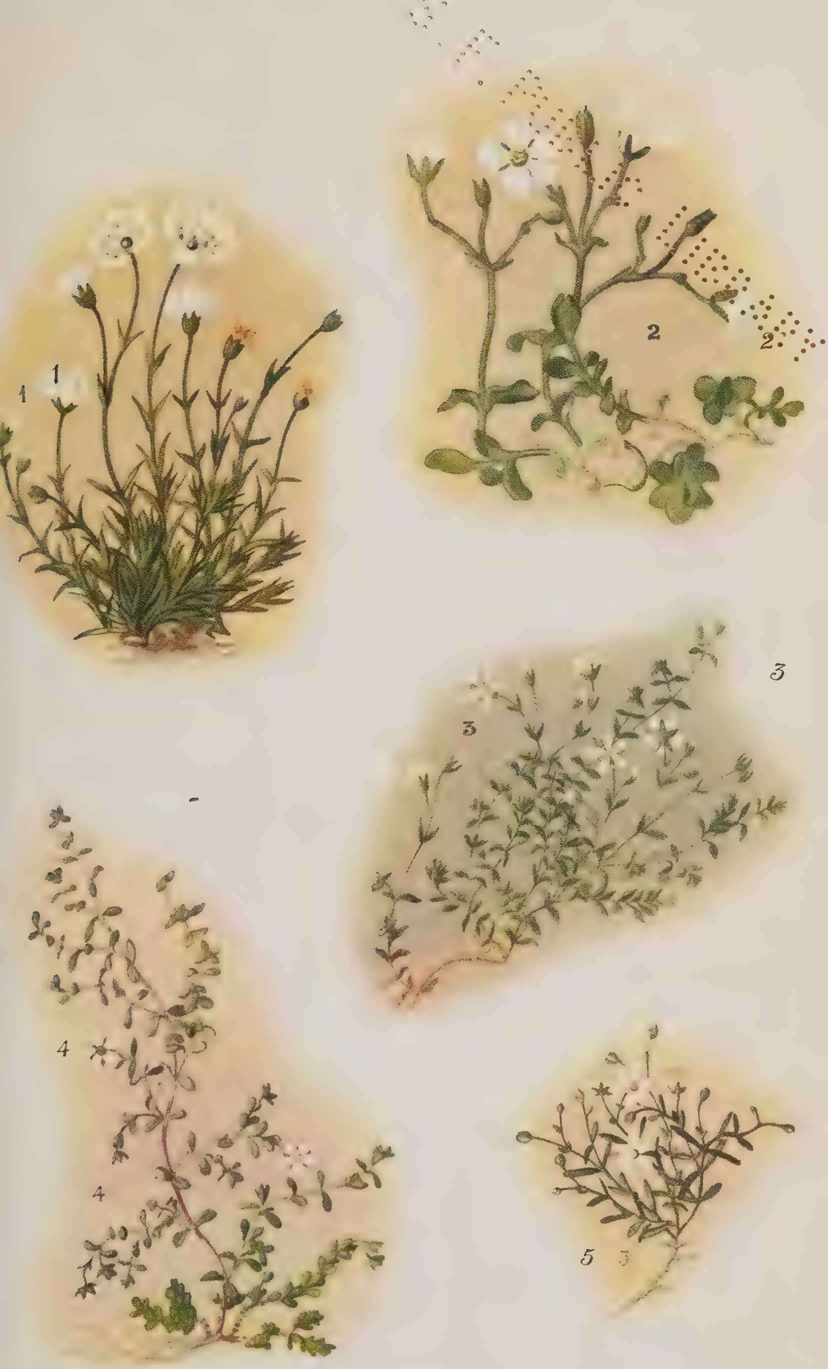

PLATE XV.

1. Arenaria grandiflora All.
2. Cerastium alpinum L.
3. Arenaria ciliata L.
4. Arenaria biflora L.
5. Mœhringia Ponæ Fenzl.

Cerastium grandiflorum W. and K.

A useful and well-known rock plant, covered with greenish grey tomentum. Leaves linear, fleshy, often with curled hairs at the base. Flowers large, handsome, sometimes covering the whole plant with white. Teeth of capsule revolute.

Rocky pastures in Upper Styria and elsewhere in the Eastern Alps; rare. July, August.

Grows easily and freely from cuttings or by division, but is somewhat too rampant to associate with the smallest and choicest Alpines.

Cerastium trigynum Vill. (*C. cerastioides* (L.) Britton.)

Stems prostrate and much-branched. Plant glabrous, except for minute hairs down one side of the branches, or rarely generally hairy (var. *nivale* Williams). Leaves narrow, and often curved to one side. Flowering branches 1–2 inches high, with 1 or 2 flowers on rather long peduncles. Styles usually 3, but sometimes 4 or even 5. Teeth of capsule always double the number of styles.

Moist, stony places in the high granitic Alps up to 9000 feet. July, August.

Distribution.—Alps and Pyrenees, Central and Northern Europe to the Arctic circle, Western Asia, North America. Frequent in the Scotch mountains.

ALSINE Wahl.

Petals 5, or rarely 4, entire or slightly notched. Stamens 5, 8, or 10, all attached to the disc. Styles usually 3. Capsule 3-valved. Leaves mostly linear, or linear-lanceolate. A considerable genus, spread throughout the greater part of the globe, but especially in temperate regions. Many are now placed in MINUARTIA.

Alsine lanceolata Mert. and Koch. (*A. rupestris* Scop.) (Plate XIV.)

Plant creeping, with short branches, which are terminal and 1-flowered, or sometimes 2–3 flowered. Leaves ovate or lanceolate, acute, flat, ciliated, otherwise glabrous. Sepals lanceolate, 3-veined, nearly as long as the petals. Petals 5. Stamens 10. Seeds with a crest of hairs on the margin.

Elevated rocks in the Alps; 7000–8200 feet; rare. July, August.

Distribution.—Eastern and Western Alps. In Switzerland only in the Grisons and on the Simplon.

Alsine Cherleri Fenzl. (*Cherleria sedoides* L.). (Plate XIV.)

Crowded, branched stems, densely covered with leaves, cushion-like. Leaves imbricate, linear, grooved, keeled, thickened at the margin, and hence almost trigonous, obtuse, glabrous like the entire plant, the lower leaves dry. Flowers solitary at the ends of the stems, shortly stalked. Calyx-teeth 5, equal in length, lanceolate, Rocky places among debris of the calcareous Alps, from 4000–6500 feet; local. June to August.

Distribution.—Moravia, Eastern Alps, some of the Western Alps, Jura, Salève, but not actually in Switzerland.

Arenaria ciliata L. (Plate XV.)

Stem prostrate, creeping. Branches ascending, densely covered with small, nearly round leaves; lower part of stem covered with short hairs. Leaves obovate, shortly acuminate, nearly sessile, glabrous, ciliated towards the base. Flowers terminal, or in forks of the branches, solitary, or in a 3-partite cyme; often axillary. Flower-stalks erect, filiform, with soft hairs in lower part. Sepals lanceolate, acute, 3-nerved, with narrow membranous margin, glabrous, slightly ciliated towards apex. Petals elliptical, longer than calyx. Capsule nearly globular, longer than calyx, six-lobed. Seeds kidney-shaped, finely warty.

Damp, stony places in the Alpine limestone region up to 9000 feet; frequent. July, August.

Distribution.—Eastern, Central, and Western Alps; Carpathians, Pyrenees, Central and Northern Europe as far as Iceland and Spitzbergen. Very rare in the British Isles.

Arenaria biflora L. (Plate XV.)

Nearly glabrous. Stem procumbent, branched, creeping, very leafy, with short, prostrate branches on which are 1 or 2 flowers. Leaves nearly orbicular, usually running into a short, ciliate leaf-stalk, rather fleshy, small and opposite, obtuse and nerveless, with the exception of the midrib. Petals white, slightly longer than the calyx, narrowed at the base. Capsule slightly longer than the calyx.

A very distinct species, well known by its prostrate growth.

Damp, sandy places in the higher granitic Alps up to 10,000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, Albania, Macedonia, Bulgaria.

Arenaria montana L.

This much-cultivated rock plant cannot be considered Alpine, it being found in woods and *landes* in France, Spain, and Portugal.

It likes a sandy loam, and is best placed so as to fall over the face of a rock.

Arenaria balearica L.

This tiny species, occasionally found in Britain as an escape from gardens, grows in the mountains of Corsica and Sardinia, as well as in the Balearic Isles, etc. It requires a shady spot, and will soon cover the surface of a rock with its dainty green mantle and minute, star-shaped flowers on stems an inch high.

Arenaria purpurascens Ram.

This small species from the Pyrenees has ovate-lanceolate leaves with 1 nerve, and 1–4 rose-purple flowers in a terminal cyme. Flower-stalks hairy. Sepals glabrous, lanceolate-acute, 3–5 nerved. Petals obovate, half as long again as the sepals. Capsule large, cylindrical, opening into 6 erect teeth.

Distribution.—Rocks in the Alpine region of the French and Spanish Pyrenees.

It requires plenty of sun, but will grow in ordinary soil and look very attractive, for it has almost the habit of a Saxifrage, with star-shaped, purplish flowers. It is propagated from seed or by division.

Arenaria Huteri Kerner.

Stem 2 or 3 inches high. Leaves ovate-lanceolate, acute, covered with grey hairs. Flowers large, white Petals ovate. Sepals 4–6, without nerves.

Stony or sandy places in Southern Tyrol. June, July.

This charming little plant requires plenty of sand in the loam, and a south-west aspect. It should be planted in a level part of the rockery, and a top-dressing of sand and leaf-mould will help it greatly.

The majority of the Sandworts (*Arenaria* and *Alsine*) do not require any special treatment, and an ordinary soil will suit them. Propagation is usually by division. They form useful carpeters, but few of them are of marked individuality. *Arenaria norwegica* Gunn and *A. gothica* Fries, two very rare British species, should, if possible, figure in a collection of Sandworts, for they are dwarf and compact, and have fairly large flowers. They like very poor, stony soil. *A. gothica* is only found in Britain about Ingleborough and Ribblehead in Yorkshire, and it is spreading fast, according to Mr. Reginald Farrer, who says : " It requires the moraine garden, and a soil all chips and sterile stone dust if it is to keep its pretty, independent character." [1]

MŒHRINGIA L.

Petals 5, rarely 4, expanded. Stamens 10, rarely 8. Capsule 3–6 valved. Styles usually 3. Leaves nerveless, or 1–3 nerved. Seed with a mantle-like appendage at the base.

A small genus of about 15 species inhabiting Central and Southern Europe.

Mœhringia muscosa L. (Plate XII.)

Stem fragile, prostrate or ascending, branched, glabrous like whole plant. Leaves narrowly linear, or acicular, acute, nerveless. Flowers small, white, 1–3 flowered, or forked loose cymes ; flower-stalks elongated after flowering, and standing out horizontally. Calyx-teeth 4, ovate-lanceolate, acute, 1-nerved, with membranous margins. Petals 4, longer than calyx. Stamens 8. Styles 2. Capsule 4-valved. Forming large, dense, evergreen patches on damp rocks, banks, and walls, and in mossy, shady places of the mountain region up to 6500 feet at least. May to August.

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[1] *My Rock Garden*, p. 27.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees; Jura, Erzgebirge, Cevennes; Europe, from Spain to Servia.

A useful evergreen plant for filling up gaps in moist, shady places in rock gardens. The flowers are rather too small in the drawing.

Mœhringia ciliata (Scop.) Dalla Torre (*M. polygonoides* Mert. and Koch.).

Stem 2–6 inches high, very brittle, prostrate, or ascending, branched, glabrous, like the whole plant, except for a few fine hairs on the leaves and flower-stalks. Leaves narrowly linear, rather flat, acute or obtuse, nerveless, grass-green, somewhat wrinkled, short. Flowers in 1–2 flowered cymes; flower-stalks erect after flowering. Flowers pale white, a little larger than in *muscosa*. Calyx-teeth 5, ovate-lanceolate, obtuse, 1–3 nerved, membranous at the margin. Petals 5, longer than calyx. Stamens 10. Style 3. Capsule 6-lobed. More crowded in structure than the former species, and with shorter leaves, but in cultivation it is said to merge into it.

Damp limestone debris in the Alps up to 7600 feet. July.

Distribution.—Eastern, Central, and Western Alps.

Mœhringia Ponæ Fenzl. (Plate XV.)

Stems elongated, tufted, 1–2 inches high. Leaves linear, obtuse, shortly mucronate, nerveless, fleshy, glabrous, sea-green; all cylindrical, or the upper ones flat on the upper side. Flower-stalks terminal, usually 2-flowered. Flowers white, like those of the last species. Sepals ovate-lanceolate, obtuse, 3-nerved. Steep rocks in the lower Alps, descending to the valleys. May.

Distribution.—Eastern Alps.

There are several more Alpine species in the Eastern Alps, and *M. dasyphylla* Bruno of the Maritime Alps, Liguria, and the Department of Var. The var. *β Tendæ* Burnat grows on limestone cliffs about Tenda and San Dalmazzo di Tenda, but is so small and brittle as to be almost impossible to get out of the crevices of the cliffs where alone it is found. *M. papulosa* Bert. is another rare species of the Maritime Alps, which grows at about 3000 feet, on rocks, in the valley of Rio Freddo.

Sagina repens Burnat. (*S. glabra* Koch.)

A small, creeping plant, glabrous or glandular, hairy, with half-woody rootstock. Stems prostrate, and then ascending. Leaves linear, mucronate. Flowers white, on long peduncles, drooping after flowering. Sepals 5, obtuse. Petals 5, oblong, half as long again as the sepals. Stamens 10. Styles 5, or very rarely 4. Capsule with 5 valves, slightly exceeding the calyx.

Sandy, grassy places in high mountains, up to 8500 feet on the Col du Galibier, and descending into the Pine zone; local. July, August.

Distribution.—Eastern, Central, and Western Alps.

Sagina Linnæi Presl.

A small, glabrous plant, with longer leaves and smaller flowers than the last. It ascends to over 7000 feet in the Alps.

Distribution.—Central and Arctic Europe; North America (British).

HERNIARIA L.

This genus was formerly put in *Illecebraceæ*, but it and the other genera of that family, including *Paronychia*, are now usually merged in *Caryophyllaceæ*.

Herniaria has very few species, all growing in sandy places, often near the sea, in Southern Europe, Central Asia, and Africa. The only Alpine species is:—

Herniaria alpina L.

A very dwarf, creeping, hairy little plant of a yellowish green colour, smaller in its parts than the better-known and often cultivated *H. glabra*. Root thick and tapering. Stems almost woody at the base, creeping. Leaves very small, obovate, ciliate. Flowers very small, green, in the axils of the leaves, in 1–3 flowered clusters. Petals sometimes 0. Sepals shortly hairy, 4–5, connate at the base. Stamens 3–5. Style bifid.

A very distinct species when once seen, and impossible to confuse with others of this difficult genus. It sometimes forms dense mats nearly a foot across, as at Mont Cenis, and on the Staffel Alp above Zermatt; but it is always prostrate on the sandy, stony ground, and occasionally it descends water-courses a considerable distance. It is found on the primary and siliceous rocks at from 6000 to 9000 feet. July to September.

Distribution.—Central and Western Alps; Tyrol, Styria.

PARONYCHIA Juss.

These curious little silvery plants are mostly Mediterranean, but there are two species which attain a considerable height in the Pyrenees and the Alps of Savoy, Dauphiny, and Provence.

Paronychia polygonifolia DC.

Stems spreading from a woody rootstock, and forming a dense cushion of small, opposite, lanceolate, glabrous leaves, oval-acuminate stipules and lanceolate, acuminate, silvery bracts. Flowers very small, greenish.

Sandy and rocky places in siliceous mountains up to 7000 feet. June to September.

Distribution.—Western and Southern Alps; Pyrenees, Corsica, Asia Minor.

Paronychia serpyllifolia DC.

Sometimes considered a variety of *P. capitata* Lamk., from which it differs by its rounded, obovate leaves and more prostrate habit. Its dense heads of silvery white bracts, which are large and broadly obovate, are very beautiful.

It flowers in June, and we have it from 5500 feet on Monte Toraggio in the Ligurian Alps, on which mountains it is not rare. It is a plant to introduce in hot, sandy places on the rockery.

HYPERICACEÆ

Herbs and shrubs with opposite or whorled leaves, often marked with pellucid dots (glands). Flowers usually in terminal cymes, regular. Sepals 5, rarely 4. Petals 5, rarely 4, usually twisted in the bud. Stamens indefinite. Ovary usually 3–5 celled, with as many styles. Placentation axillary. Seeds exalbuminous.

Hypericum is the only European genus (St. John's Wort).

Hypericum L.

Leaves opposite and entire, and no stipules. Flowers regular, usually yellow. Sepals 5. Petals 5, hypogynous. Stamens indefinite, united at the base into 3 or 5 bundles. Capsule more or less divided into 3 or 5 cells by as many placentæ, projecting from the sides to the axis, and usually opening in 3 or 5 valves.

An extensive genus, particularly abundant in Southern Europe, Western Asia, and North America, but represented also in the tropics, and in the southern hemisphere.

Hypericum Coris L.

Glabrous. Stems 6–12 inches high, slender, erect. Leaves in whorls of 3 or 4, linear, with edges recurved, spotted with glands. Flowers yellow, streaked with red, rather large, in a short corymb. Sepals linear-oblong, obtuse, glandular, ciliate. Petals 4–5 times longer than sepals. Capsule ovoid; twice as long as calyx.

Dry hills and rocks, especially on limestone up to 5000 feet; local. June to August.

Distribution.—Maritime Alps, Var, Basses-Alpes, Italy, Tyrol, very rare in Switzerland (as near Stans, etc.). Though not strictly Alpine, this beautiful dwarf species is so easily cultivated on limestone rocks, and forms such a showy mass of gold that it is mentioned here.

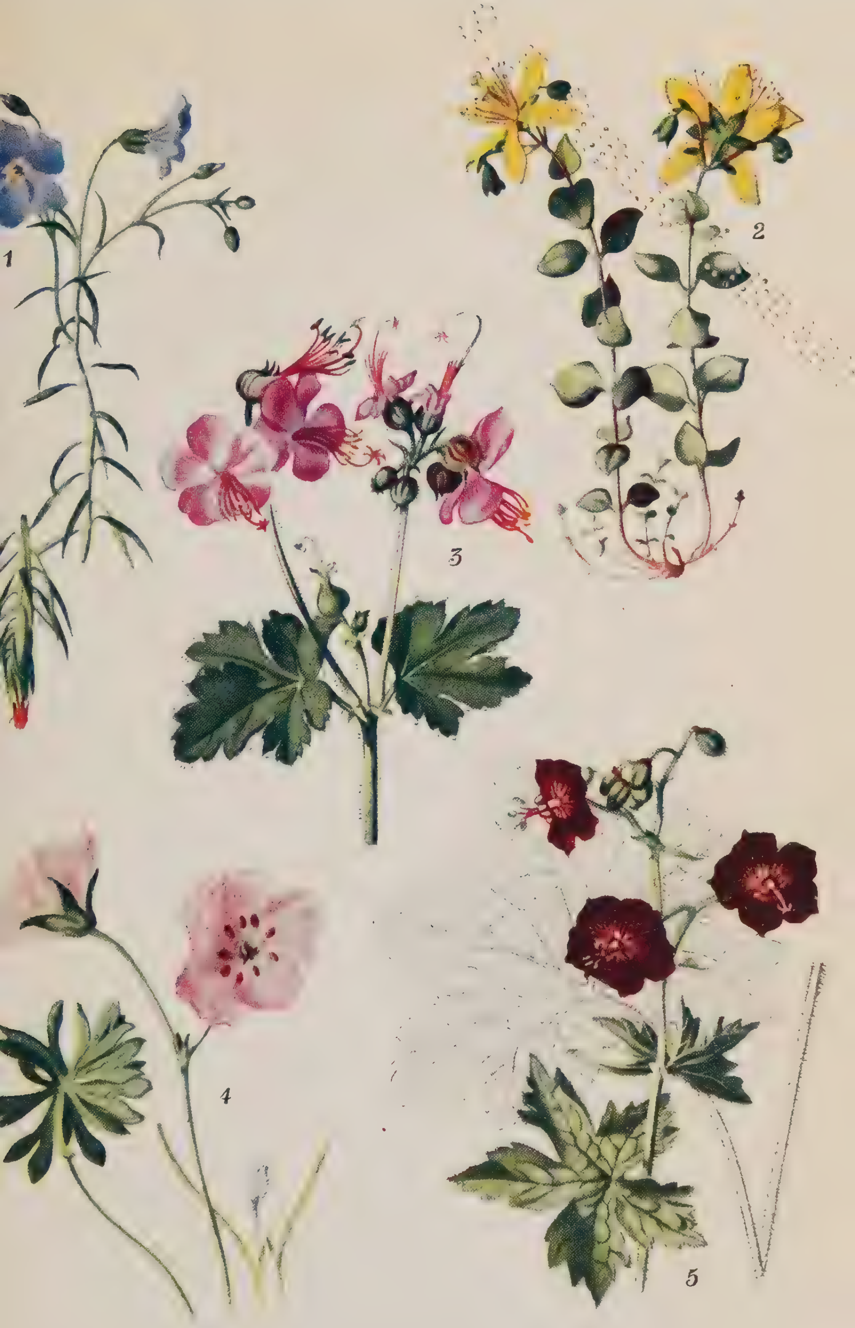

PLATE XVI.

1. Linum alpinum L.
2. Hypericum numularium L.
3. Geranium macrorrhizum L.
4. Geranium argenteum L.
5. Geranium phæum L.

[illegible]

Hypericum nummularium L. (Plate XVI.)

Stem ascending, 6–10 inches high, glabrous like the whole plant. Leaves roundish-cordate, the lower ones shortly petioled, smooth, pale below. Flowers large, usually 3–5 on a stem. Petals round, 3–4 times longer than calyx, crenate, pale yellow. Sepals blunt, serrated, glandular, ciliated. Capsule ovoid, slightly passing the calyx, and with 3 prominent styles.

Stony, damp places in calcareous mountains; rare. June to August.

Distribution.—Alps of Savoy and Piedmont, Northern Spain, Central and Western Pyrenees.

Can be planted in a sunny place on a bank, with plenty of sandy soil for its rampant roots to penetrate.

Hypericum Richeri Vill.

Glabrous. Stem erect, a foot high or more, almost round. Leaves ovate-lanceolate or oval, opposite, edged with black spots, slightly embracing the stem. Flowers large, yellow, in a few-flowered corymb. Petals 3 times longer than calyx, spotted with black. Sepals oblong-lanceolate, acuminate, finely toothed at the edge. Capsule ovoid, slightly passing the calyx.

Pastures and mountain woods up to 6000 feet, as at Lautaret in Dauphiny. June to August.

Distribution.—Jura, rare in Switzerland, Pyrenees ; Central and Southern Europe.

The Mediterranean species *H. australe* Ten. is quite as worthy a place in sunny gardens as *H. nummularium.* It is something like an exaggerated *H. humifusum*, but with large flowers which are often reddish.

LINACEÆ

Herbs or undershrubs with entire, alternate leaves, no stipules and regular flowers. Sepals 5, rarely fewer, distinct, or united at the base. Petals 4 or 5, twisted in the bud. Stamens usually 10, and usually free. Styles 5, rarely fewer. Ovary with as many cells as styles. Ovules 1 or 2 in each cell.

A small family, widely spread over the globe, and differing from the Geranium family chiefly in the foliage.

LINUM L.

Sepals, petals, and stamens 5. Cells of the capsule 5, though apparently 10, each being divided into two by a nearly complete partition.

A rather large genus, particularly abundant in the Mediterranean region and Western Asia.

Linum alpinum Jacq. (Plate XVI.) (Alpine Flax).

Root tapering, with many heads, rather woody. Stem prostrate, ascending, or erect, round, glabrous like the whole plant, 3–8 inches high, few-flowered. Leaves alternate, linear-lanceolate, apiculate, 1-nerved, entire, with smooth margin. Flowers large in lax, terminal, racemose cymes, usually congregated into a panicle; flower-stalks longer than calyx, drooping to one side when fruit is ripe. Sepals ovate, shortly mucronate, with membranous margin, glabrous, not ciliated, the 3 inner ones obtuse, the 2 outer narrower, acute. Petals distinct, azure blue, with yellow claw, though varying in shade. Stigma capitate. A polymorphic species.

Stony places among the debris of calcareous Alps, as high as 8700 feet on the Col du Galibier; often rather solitary, but widely dispersed. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, and in many parts of hilly France.

Although various other species from Southern Europe may well be cultivated in rock gardens, this is the only Alpine representative, and it can be grown from seed in a sandy loam mixed with pieces of limestone or chalk.

GERANIACEÆ

Annual or perennial herbs, or low shrubs, with opposite or rarely alternate leaves, usually stipulate, divided, and compound. Flowers regular in the principal European genera. Sepals 5. Petals usually 5, twisted in the bud. Stamens 5 or 10, often united at the base. Ovary 3–5-celled, with 1 or more seed in each, all attached to the central axis. Styles 5.

GERANIUM L.

Herbs with forked stems often swollen at the nodes, opposite, palmately divided leaves, and purplish flowers, solitary or 2 together, on axillary peduncles. Stamens 10, of which 5 are shorter. Ovary 5-lobed, terminating in a short beak, with 5 long stigmas at the top. Capsule separating into 5 one-seeded carpels, which curl upwards, and with a long elastic awn, detached from the beak.

A genus spread over the northern hemisphere, with a few species in the southern (extra-tropical).

Geranium argenteum L. (Plate XVI.)

A dwarf plant, covered with grey, silky hairs. Root thick and fusiform. Stem almost none. Leaves mostly radical, deeply 5–7 lobed; lobes 3-cleft; divisions linear. Flower-stalks 2-flowered. Petals obovate, shallowly emarginate, much longer than the sepals. Flowers large, pale pink. Sepals mucronate, hairy.

Dry, rocky places, especially on limestone; very local; 5500–7200 feet. July, August.

Distribution.—Tyrol, Carinthia, Carniola, North Italy, Departments of Hautes and Basses-Alpes in Eastern France.

The Geraniums are of easy culture (from seed or by division), and will grow in any aspect, on sandy, well-drained loam, provided they get a fair amount of sun. *G. argenteum* in particular requires sun, and is better planted in crevices between rocks, with plenty of loam and limestone in equal parts.

Geranium macrorrhizum L. (Plate XVI.)

Rootstock oblique or horizontal, thick, and covered with the tufts of withered leaves. Stem about a foot high, erect, branching dichotomously. Leaves shiny, palmately 7-fid, cut and serrated. Flower-stalks 2-flowered. Pedicels erect after flowering. Petals somewhat spathulate, bright reddish purple. Stamens curved downwards. Capsule glabrous, wrinkled transversely. A strongly scented plant.

Stony places, especially in river beds in the Alps and lower Alps up to 5000 feet; very local. June, July.

Distribution. — Carpathians, Eastern Alps, Maritime Alps, Northern Italy, Balkan Provinces, Greece.

This handsome plant should be cultivated in English rock gardens. Place it between stones in a sunny aspect, give it plenty of water at first, and after getting well established it must not be allowed to get rampant.

Geranium rivulare Vill. (*G. aconitifolium* L'Hérit.).

Stem erect, 1–1½ feet high, hairy. Leaves palmate, 5–7 cleft, cut and serrated. Flower-stalks 2-flowered, erect. Petals obovate, twice as long as sepals, white, with red veins. Stamens lanceolate, with oval anthers. Capsule densely hairy, slightly wrinkled transversely. Beak downy, not glandular. It is closely allied to the next species.

Grassy, shady places by streams in the Alps up to 7000 feet; local. July, August.

Distribution.—Tyrol, Switzerland (rare), and Western Alps.

Geranium silvaticum L.

Slightly pubescent, and somewhat glandular in the upper portion. Stem erect, 1 to 2 feet high, robust. Radical leaves on long stalks, palmately and deeply divided with 5 or 7 pointed lobes, more or less cut and serrated. Stem-leaves few, on much shorter stalks. Upper part of stem repeatedly forked, forming a rather dense panicle of handsome purplish flowers. Peduncles short, each with 2 flowers, on short pedicels, remaining erect when the fruit is ripe. Sepals sharply mucronate. Petals obovate, slightly notched, nearly twice the length of the calyx.

Meadows and bushy places in the mountains up to 7000 feet, and rarely in the south extending to 8000 feet (Col du Galibier).

Before the meadows are mown in June or July this Geranium often covers large areas, and gives quite a purple haze to the landscape. To a certain extent it takes the place of our *G. pratense*, which is rare in Switzerland.

In Britain *silvaticum* is more confined to some of the woods in the west and north, and is not often seen in meadows.

Distribution.—Throughout Europe and Russian Asia, extending to the Arctic regions.

Geranium phæum L. (Plate XVI.)

Rootstock thick, knotted, oblique, or horizontal. Stems 1–2 feet high, erect, simple or branched, covered like the whole plant with woolly hairs. Leaves roundish cordate in outline, palmately 5–7 lobed, lower leaves stalked, upper sessile; lobes 3-cleft, coarsely cut and serrated. Flowers dark violet, in loose racemose cymes; flower-stalk 2-flowered, pedicel erect or horizontal after flowering. Petals patent during flowering, roundish ovate, shortly apiculate. Carpels with 3 or 4 wrinkles in the upper part; beak finely downy, not glandular.

Thickets, ravines, and meadows in the Alps and lower Alps up to 5300 feet; local. May to July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Central Europe from Scotland to Bulgaria and Thrace.

In Switzerland rather rare, and a pale violet variety seems frequent in several places at about 5000 feet, as at the Col de la Forclaz, between Chamonix and Martigny.

RHAMNACEÆ

A large family, widely spread throughout the globe, but with very few European genera.

Rhamnus pumila Turra.

A small undershrub, with prostrate branches clinging to the rocks; entire, finely toothed leaves, with 4–7 somewhat curved lateral parallel veins on each side of the mid-rib. Flowers in small axillary cymes, unisexual, greenish, very small. Petals narrow or wanting. Sepals with 4 lanceolate lobes.

Calcareous rocks of the Alps and lower Alps up to about 7200 feet, and occasionally higher in Savoy. June, July.

Distribution.—Eastern, Central, and Western Alps; Pyrenees.

Rhamnus alpina L.

A much larger (erect) shrub, 1–3 yards high. Leaves large, oval, suddenly contracted into a triangular apex, or sometimes obtuse, lateral veins, 8–14. Flowers similar; lobes of the calyx triangular.

Dry, rocky places, and among debris up to 5500 feet. May, June.

Distribution.—Western Europe, Morocco and Algeria.

LEGUMINOSÆ

Herbs, shrubs, or trees, with alternate and generally compound leaves usually furnished with stipules. Flowers very irregular, consisting of 5 petals, the upper one, called the *standard*, usually the broadest, the two lateral ones, called *wings*, are between the standard and the two lower ones, which are inside of all, and united more or less by their outer edge into a single one called the *keel*. Stamens 10, the filaments united into a sheath, or the upper one distinct. Ovary 1-celled, with 1–2 or more ovules arranged in 1 or 2 rows on the ventral suture. Fruit a legume or pod, usually opening in two valves. Seeds with two large cotyledons.

A very large family of some 7000 species, widely spread over the globe. An enormous number of species are found in Southern Europe.

There is no species of *Genista* which is strictly Alpine, though several are found in sub-alpine regions, and *G. sagittalis* up to about 5000 feet.

Cytisus alpinus L. (Plate XVII.)

A small, glabrous tree, 6–20 feet high. Leaves trifoliate, on long stalks; leaflets large, entire, pointed, shortly stalked, green on both sides, glabrous, or hairy only at the margin. Flowers rather smaller than in *C. Laburnum*, in a large, pendant, downy raceme. Legume glabrous, shining, with a winged keel to the upper suture.

Mountain woods and bushy places up to 5000 feet; local. June, July.

Distribution.—Jura, Eastern, Central, and Western Alps.

Possibly the figure may be *Cytisus Laburnum* L., which is also found in limestone woods, sometimes as high as *C. alpinus*.

Cytisus hirsutus L.

This dwarf and very distinct species reaches 6000 feet in the Maritime and Ligurian Alps, and flowers from May to July according to situation. It turns somewhat black on being dried.

Distribution.—Central and Southern Europe, Western Asia.

ONONIS L.

Herbs, or low undershrubs, with pinnately trifoliate, or rarely simple leaves; leaflets generally toothed. Stipules leafy. Flowers solitary, on axillary peduncles, often forming leafy racemes. Calyx with 5 narrow segments. Standard large and striate. Keel ending in a pointed beak. Pod inflated, with few seeds.

A numerous genus, chiefly from the Mediterranean region.

Ononis cenisia L.

A dwarf, trailing, glandular, pubescent species. Stem a little woody at the base. Leaves trifoliate, shortly petioled, with oboval, sessile, strongly toothed, glabrous leaflets. Stipules sheathed. Flowers a beautiful rose colour, rather large, veined, solitary, on longish peduncles. Calyx lobes scarcely longer than the tube. Pod 10–12 mm. by 6 mm., at least twice the length of calyx; pubescent, glandular.

Pastures in the Alps up to 7300 feet; very local. June to August.

Distribution.—Savoy, Dauphiny, Provence, Piedmont, Spain, Eastern Pyrenees, Morocco and Algiers. At Mont Cenis it grows on the plateau behind the Hospice, and appears very local in the immediate district. Not found in Switzerland.

This beautiful little Rest-Harrow should be introduced into English rock gardens, for it is the best of the dwarf species, and strictly Alpine. It should be planted in poor, but deep, well-drained, stony soil, in full sun.

Ononis rotundifolia L.

Pubescent, glandular. Stem about a foot high, erect or ascending. Leaves large, trifoliate, petioled, with orbicular or oval-toothed leaflets. Flowers rose-coloured, large, 2–3 on axillary peduncles, terminated by a mucro. Corolla twice as long as the calyx. Pod 25–30 mm. by 6–7, drooping, glandular, hairy, with 5–9 seeds.

Dry, stony places in limestone mountains up to 5700 feet. May to August.

Distribution.—Eastern, Central, and Western Alps from France to Carinthia. Pyrenees and Spain.

A very distinct and handsome species.

Ononis Natrix L.

This plant is not really Alpine, though it sometimes figures so in seedsmen's catalogues, because it is a suitable plant for the rockery in hot places if there is plenty of lime in the soil. It is a robust, very viscous plant, 1–2 feet high, with lemon-yellow flowers streaked with red. It grows in hot, stony, or sandy places, in limestone districts, and is sometimes, as in the Rhône Valley, so plentiful as to be mown down for fodder. It reaches a height of about 5000 feet in Switzerland.

Distribution.—Central and Southern Europe, Western Asia, North Africa.

TRIFOLIUM L.

Herbs with stipules adhering to the leaf-stalks. Leaves trifoliate; leaflets often toothed. Flowers in dense capitate heads. Calyx toothed. Petals narrow, usually remaining round the pod after fading. Stamens diadelphous, the upper ones entirely free. Pod scarcely protruding beyond the calyx, containing from 1 to 4 seeds.

A numerous and widely spread genus, particularly in the northern hemisphere.

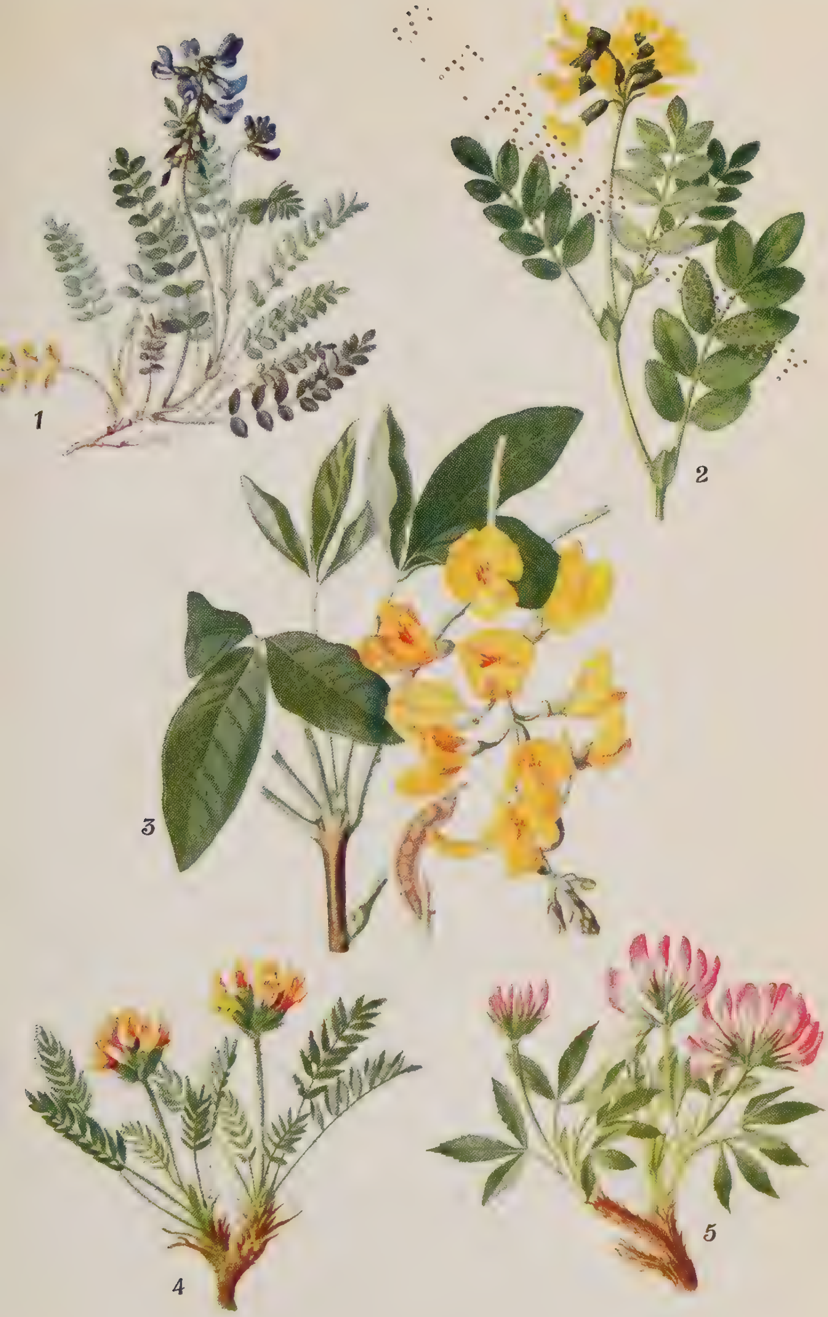

PLATE XVII.

1. Astragalus alpinus L.
2. Phaca frigida L.
3. Cytisus alpinus Mill.
4. Oxytropis campestris D.C.
5. Trifolium alpinum L.

Trifolium alpinum L. (Plate XVII.)

A small, glabrous, stemless plant, the leaves and flowers being all radical. Leaflets linear-lanceolate, toothed, mucronate. Scape terminating in a dense head of stalked and finally pendent flowers, 3–8 in an umbel. Flowers twice as long as the glabrous calyx, flesh-coloured, rose, or rarely white.

Grassy Alpine and subalpine declivities, preferring the siliceous rocks, and sometimes forming a regular sward. 4000–9000 feet. June to August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Spain.

Trifolium pallescens Schreb.

Glabrous. Stem ascending or creeping, leafy. Leaves petioled with obovate leaflets. Rather small, globular heads of pink or yellowish white flowers; flower-stalks bent down after flowering. Calyx glabrous, with unequal teeth, the upper teeth longer than the calyx tube. Standard 3 times length of calyx.

Pastures and debris, especially on granite; local; 6000–7500 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, Carinthia, Pyrenees.

Trifolium Thalii Vill.

A glabrous plant, resembling *T. repens* in habit, but with pink flowers, and the peduncles all springing from the rootstock. Calyx glabrous, with the upper teeth rather shorter than the calyx tube. Standard twice as long as calyx.

Pastures and moraines of the Alps from 5000 to 8000 feet; local. July, August.

Distribution.—Jura, Bavaria, Eastern, Central, and Western Alps, Pyrenees.

Trifolium saxatile All.

Hairy, with small lanceolate leaflets. Large stipules, dotted with reddish black, and slightly sheathed, the free portion being oval and acuminate. Calyx 10-nerved, very hispid, with erect, subulate teeth. Flowers pale pink, in a globular head.

Moraines and gravelly places; rare; 5500–8200 feet. July, August.

Distribution.—Simplon, Zermatt Valley, Tyrol, Oetzthal.

Trifolium badium Schreb.

Almost glabrous. Stems erect or ascending, 6–12 inches high. Spikes finally globular. Flowers golden yellow, and then light brown. Peduncles thick, longer than the leaves. Stipules lanceolate, acute, shorter than the petiole. Upper leaves opposite; leaflets sessile, obovate, toothed.

Rocky pastures of the Alps, 4000–9000 feet, especially on limestone, but widely spread. July, August.

Distribution.—Jura, Eastern, Central, and Western Alps, Cevennes, Pyrenees, Apennines, Carpathians, Western Asia.

T. repens, *T. pratense*, and its beautiful cream-coloured variety, *T. alpestre* and *T. noricum* (Tyrol, etc.), are often found in the Alpine region.

In cultivation the trefoils are of little value, except for fodder. On the rock garden, *T. alpinum* and *T. badium* are the best, being both very distinct and pretty.

ANTHYLLIS L.

Rather dwarf herbs with pinnate leaves and yellow, red, or purple flowers in crowded heads, with a deeply divided bract close underneath. Stipules small or 0. Calyx inflated, with 5 small teeth. Stamens united in an entire sheath. Pod enclosed in the calyx. A small genus, chiefly from the Mediterranean region.

Anthyllis montana L.

Stem woody at the base, ascending, 6–12 inches high, tufted, covered with silky wool like the whole plant. Leaflets in 8–20 pairs, all the same size. Bracts shorter than the head of flowers, which is about 1 inch in diameter. Flowers 15–16 mm. long, rose-coloured. Calyx with plumose, unequal teeth, suddenly spreading. Occasionally the flowers are a deep carmine.

Rocks and hot, stony places on limestone, from 4500 to 6500 feet. May to July.

Distribution.—Jura, Central and Western Alps, Cevennes, Pyrenees, Algeria. Very rare in Switzerland.

In cultivation it is best planted between blocks of limestone in a well-drained, sunny position.

Anthyllis vulneraria L.

This well-known British plant is often seen on shale and limestone in the Alps up to 8000 feet, and sometimes the mountain sides are golden with its yellow flowers in August, as e.g. on the shaly hillside below the Col de Balme, on the Chamonix side, where little else seems to grow. There are several varieties, of which the best-known is var. *rubriflora* Koch = *A. Dillenii* Schultz. It has pink or carmine flowers, and grows in rocky pastures in the Alps up to 7000 feet. The form of *rubriflora* called *minor* has small heads of smaller red flowers on rather long peduncles, and the habit is quite prostrate. We found it at about 6600 feet in the beautiful Valsorey, above Bourg St. Pierre, but, unfortunately, plants which were sent to England of this rare form did not survive. *A. vulneraria* itself is very polymorphic, and its varieties seem little understood.

ASTRAGALUS L.

Herbs with pinnate leaves and flowers in axillary cymes or spikes, without leafy bracts. Stipules entire at the base. Calyx with 5 teeth. Petals usually narrow. Keel obtuse. Stamens diadelphous. Pod cylindrical or inflated, usually divided lengthwise by a complete or partial partition proceeding from the side of the keel.

One of the largest genera known (about 900 species), distributed all over Europe, Central and Northern Asia, North America, and down the Andes of South America. Some penetrate far into the Arctic.

Astragalus alpinus L. (*Phaca astragalina* DC.). (Plate XVII.)

Stem procumbent, then ascending, 3–8 inches high, slender, covered like the leaves with an adpressed down. Leaves pinnate, with 8–12 pairs of lanceolate or oval leaflets. Spike compact, corymbose. Flowers shortly stalked. Standard blue. Wings white. Keel violet at apex, nearly as long as standard. Legume pendent, elongated, covered with rough black hairs. Fruit-stalk longer than calyx.

Stony or grassy places and pastures in the Alps, especially on the primary formations, 5000–8200 feet. July, August.

Distribution.—Alps and Pyrenees. High mountains of Europe, as far north as Lapland. Very rare in Britain.

This delicate little plant will grow in ordinary soil, and does not object to the company of other small plants.

Astragalus australis (L.) Lam. (*Phaca australis* L.).

Glabrescent, slender, but taller than the last. Leaves with 4–8 pairs of scattered leaflets, which are oblong-lanceolate. Stipules ovate or lanceolate. Inflorescence a loose panicle. Corolla white, or yellowish white, with the keel bluish violet above. Calyx hairy, bell-shaped. Pod glabrous, large, and inflated, with a long carpophore.

Rather damp, stony places in pastures and moraines of the high Alps, mostly on the primary rocks, 6500–8200 feet; local. July, August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Carpathians.

Astragalus hypoglottis L.

A small, hairy, diffuse plant. Leaflets oblong, 8–12 pairs. Flowers violet, erect, 10–20 in a dense sub-globular head. Peduncles longer than the leaves. Calyx hairy, tubular, with short, linear teeth. Standard oval, emarginate. Pods 10 mm. by 4, erect, oval, heart-shaped at base, with long white hairs, divided longitudinally into 2 cells.

Dry Alpine pastures. June to August.

Distribution.—Central and Western Alps (not in Switzerland), Northern Europe and Russian Asia (British).

Likes a well-drained soil, plenty of lime, and a sunny aspect.

Astragalus purpureus Lamk.

Stem spreading, prostrate, or ascending, hairy like the whole plant. Leaflets ovate-lanceolate, in 10–12 pairs. Petals bright purple. Calyx hairy, tubular, with irregular linear teeth. Standard oblong, emarginate. Pods 10 or 12 mm. by 5 mm., erect, oval, heart-shaped at base, hairy.

Limestone hills, 3500–6500 feet. May to July.

Distribution.—Southern and Western Alps, Piedmont, Tyrol, Montenegro.

Astragalus Onobrychis L.

Very similar to the last, but with 6–12 pairs of leaflets, and covered with whitish hairs. Calyx-teeth lanceolate, about one length of the tube. Standard linear-oblong, truncate. Pod 10 or 12 mm. by 5 mm., erect, oval, hairy. A handsome plant, well worth cultivating.

Mountains in hot districts up to 5000 feet. June to August.

Distribution.—Western Alps, Southern Europe and Western Asia.

Likes sun, and prefers limestone, under which conditions it spreads rapidly, and throws up plenty of long-stalked crimson-purple spikes.

Astragalus monspessulanus L.

Almost glabrous, green. Stems 0, the flower- and leaf-stalks springing from the roots. 10–20 pairs of elliptic leaflets. Stipules linear-lanceolate. Flowers purple, in oval heads, elongated at maturity. Peduncles equalling the leaves. Calyx glabrescent, tubular, with teeth about half length of tube. Pods very long, 25–35 mm. by 3 mm., subcylindrical, curved, almost glabrous.

Limestone hills in hot places. April to June.

This species has a wide range, both of altitude and longitude, and it is not really Alpine. We have seen it at Beaulieu on the Mediterranean, at Pigna in the Ligurian Alps (1200 feet), and as high as 6300 feet on the plateau of Mont Cenis.

Distribution.—Central and Southern Europe, very local in Switzerland, Caucasus, Tunis, Algeria.

Plant in a sunny aspect on calcareous soil. It is easily cultivated and grows fast.

Astragalus depressus L.

A small, prostrate species, with hardly any stem, and a thick rootstock. Flowers yellowish white, with violet spots at the tip of the keel. It grows in meadows and pastures of the Alps and sub-Alps. May to July. Rather an insignificant plant.

Distribution.—Central and Western Alps (local in Switzerland), Central Pyrenees, Algeria and Morocco. We have seen it in the Italian Maritime Alps at about 5500 feet.

Astragalus aristatus L'Hérit.

Woody at the base, and forming great mats of spiny shoots. Stem very short, whitish, pubescent. Leaves with 6–10 pairs of linear-oblong leaflets. Stipules linear-acuminate. Flowers white or washed with lilac, erect, 3–8 in short, loose clusters, slightly peduncled. Bracts lanceolate. Calyx very woolly with setaceous teeth equalling the tube.

This very marked species is the only one of the spiny kinds which can be considered Alpine or subalpine. We have seen it, near the top of the Col di Tenda, and on the Aiguille du Goléon in Dauphiny, at the remarkable height of 8500 feet, or 2590 metres. It prefers limestone or shale.

Distribution.—Western Alps (not in Switzerland), Pyrenees, Greece, Sicily, Italy.

Should be planted in a limy soil with plenty of stones, and where it can have room to spread and form a big mat.

PHACA L.

Leaves pinnate. Flowers in axillary racemes. Style subulate, not bearded; ovules more than 2. Pod, or legume, more or less inflated and membranous, 1-celled.

Phaca frigida L. (Plate XVII.)

Stem erect or ascending, simple, nearly glabrous, 8 to 18 inches high. Leaves pinnate, bright green, paler below, with 4–5 pairs of leaflets, oval, entire, obtuse, glabrous above, more or less hairy below and on the margin. Stipules leaflike, ovate, semi-amplexicaule. Flowers pendent, in short, compact, axillary racemes, pale yellow. Legume elongated, inflated, with a short carpophore, covered with short hairs; pedicels short.

High Alpine pastures, especially on primitive rocks; local; 5800–8600 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, Carpathians, Jura, Northern Europe, and Russia.

Phaca alpina Jacq. (Plate XVIII.)

Stem 1–2 feet high, glabrescent. Leaflets in 9–12 pairs, ovate-lanceolate. Stipules linear-lanceolate. Flower-stalks blackish. Flowers brownish yellow. Calyx-teeth linear-lanceolate. Legume half ovate, when young covered with rough hairs, nearly glabrous when older; stalk of legume nearly as long as calyx; carpophore slender.

Stony places and pastures, 4000–6500 feet. July, August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Bavaria, Sweden.

These two species of *Phaca* are only suitable for the back portions of large rock gardens; but they must be in well-drained soil, and preferably with plenty of grit.

OXYTROPIS DC.

Low, tufted perennials, only differing from *Astragalus* in the keel, which has a small point at its extremity, either erect or slightly recurved, and in the pod, which has an incomplete longitudinal partition projecting into the cavity from the angle next the vexillum, not from the angle next the keel.

Another large genus, of about 200 species, but not so widely spread as *Astragalus*, and chiefly confined to mountain stations in Europe, Asia, and North America.

Oxytropis campestris DC. (Plate XVII.)

Stock short and tufted, covered with old leaf-stalks and stipules. Plant covered with scattered hairs, or rather shaggy. Leaflets usually in 12 pairs, lanceolate, acute. Peduncle longer than the leaves, and hairy like the calyx. Spikes capitate, ovate. Bracts nearly or quite as long as calyx. Flowers lemon-yellow, occasionally with brownish claws (as in the figure), or white or blue (var. *cærulea* Koch.). Legume erect, sessile within the calyx, ovate, inflated, pointed, semibilocular.

Stony places and pastures in the Alps up to 9500 feet, and descending into the plains. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees, Scandinavia, Britain (very rare). Found on most of the high mountains of Europe.

Oxytropis sordida Gaud.

Closely resembling the last, of which it is sometimes considered a variety, differing chiefly in the more silky leaves and the dusky colour of the flowers, which are yellowish at the base, with blue keel and standard.

Gravelly places and Alpine meadows 6600–8200 feet. July, August.

Distribution.—Central and Western Alps.

Oxytropis fœtida DC.

Plant with viscid, fœtid glands. Leaflets generally in about 20 pairs. Flowers yellowish white, 4–7 in a rather loose, oval head. Hairy calyx, with very short teeth. Pod about 20 mm. long by 5 mm., slightly curved and channelled, pubescent, glandular.

Rocky places and pastures in the Alpine zone. July, August.

Distribution.—Central and Western Alps. In Switzerland only in Canton Valais.

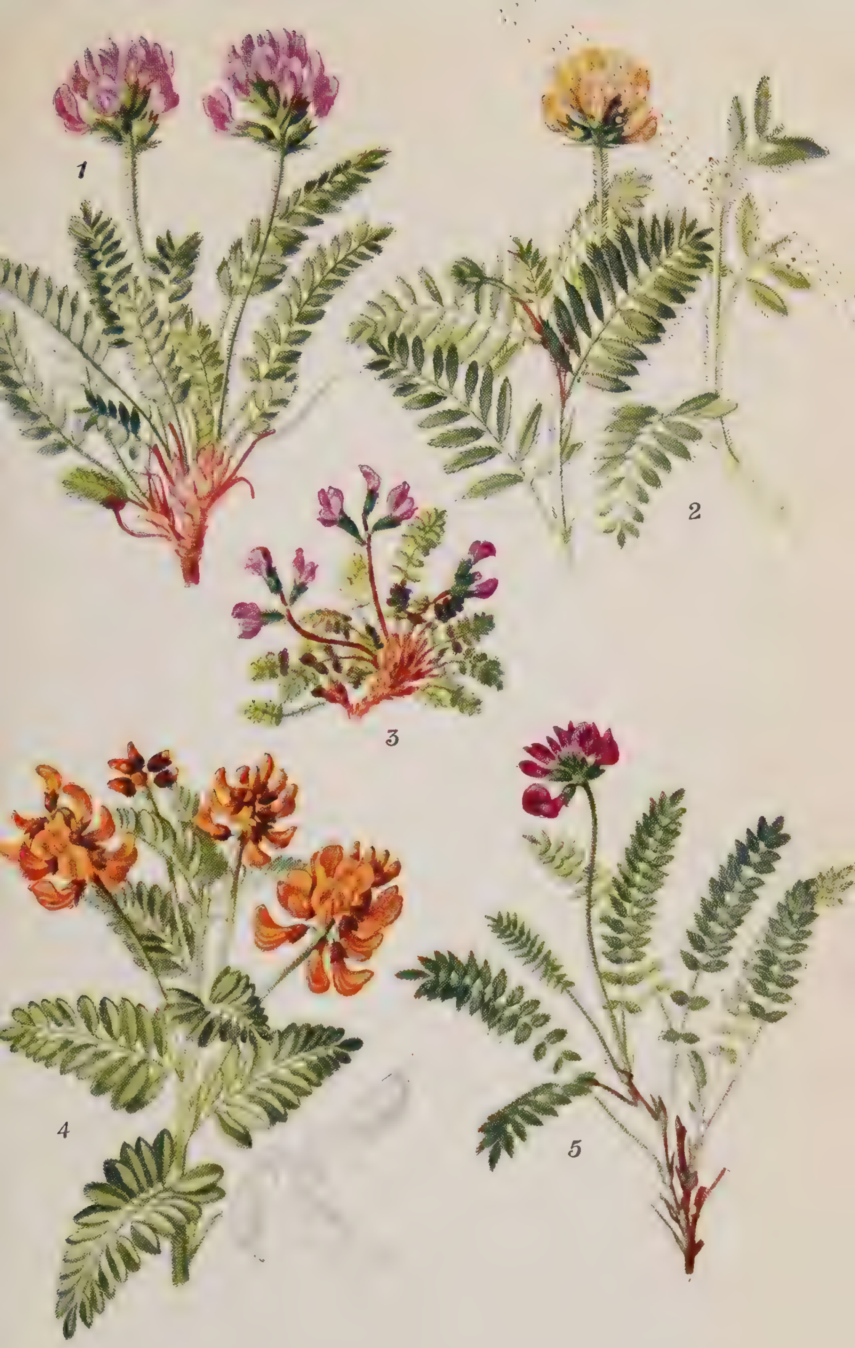

PLATE XVIII.

1. Oxytropis Halleri Bunge.
2. Oxytropis pilosa D.C.
3. Oxytropis triflora Hoppe.
4. Phaca alpina Jacq.
5. Oxytropis montana D.C.

Oxytropis pilosa DC. (Plate XVIII.)

Stem erect or ascending, woody, 4–12 inches high, woolly like the whole plant. Leaves pinnate, with 7–13 pairs of lanceolate or linear, entire, mucronate leaflets. Stipules lanceolate, sessile at base of leaf-stalk. Flowers ochre-yellow, in dense, ovate heads, at length elongated spikes. Pod erect, linear-lanceolate, nearly cylindrical, woolly, nearly sessile within the calyx.

Sunny hills and stony pastures in the Alps. May to July.

Distribution.—Jura, Eastern, Central, and Western Alps, Western and Central Asia as far as China.

Oxytropis Halleri Bunge. (*O. uralensis* DC. part.). (Plate XVIII.)

Covered with white, silky hairs. Leaves 2–3 inches long. Leaflets in 10–11 pairs. Scape up to 3 inches high. Flower-stalk longer than the leaves. Raceme in an ovate spike, crowded with erect violet-blue flowers. Bracts as long as calyx. Legume erect, sessile within the calyx, inflated, ovate-acuminate, covered with white hairs.

Stony Alpine and subalpine pastures, 6000–8000 feet; rather rare, especially in Switzerland. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Pyrenees, Spain, Scotland.

Oxytropis lapponica Gaud.

Stem ascending, clothed with grey hairs. Leaflets in 8–12 pairs, lanceolate, acute. Stipules ovate-lanceolate. Flower-stalk thick, at length double as long as leaf. Panicle short, 6–12 flowered; flowers light violet, turning blue on drying. Calyx-teeth equalling tube of calyx. Legume pendent, lanceolate-cylindrical, covered with short black, adpressed hairs, shortly stalked—the stalk being less than half length of calyx.

Alpine meadows and pastures on primary rocks, 6500–8200 feet; rare. July, August.

Distribution.—Eastern, Central, and Western Alps, very local in Switzerland; Central and Northern Europe, Northern and Central Asia.

Oxytropis montana DC. (Plate XVIII.)

Rootstock spreading. Stem very short, or altogether wanting, leafy at apex, covered with patent hairs like the whole plant. Leaflets in 8–15 pairs, ovate or lanceolate, acute, entire, small, bluish green on upper side; rachis of leaf reddish. Stipules ovate or lanceolate, sessile. Flowers bright violet-red, in compact, roundish, or ovate axillary spikes. Legume erect, elongated, inflated, covered with black hairs, distinctly stipulate within the calyx. Stalk of legume as long as calyx-tube.

Stony places and pastures in the limestone Alps, 5500–9500 feet. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Pyrenees.

Oxytropis neglecta Gay (*O. Gaudini* Bunge, *O. cyanea* G. G., not M. B.).

A prostrate or ascending plant, covered with grey hairs. Leaflets in pairs of 7–10, oval or lanceolate. Flowers bluish, in heads of 5–12, or rarely more. Calyx hairy, with teeth half the length of the tube. Pods 12–15 mm. by 3 or 4 mm., linear-oblong, hairy, on short stems about half the length of calyx.

Rocky places and high pastures from 6200–8500 feet. July, August.

Distribution.—Eastern, Central, and Western Alps; very rare in Switzerland.

Oxytropis triflora Hoppe. (Plate XVIII.)

A small stemless species about 3 inches high, covered with grey hairs. Leaflets in 7–11 pairs, ovate-lanceolate, obtuse. Spike short, on a filiform scape, usually 3-flowered. Flowers violet-blue, yellowish white at base. Bracts linear, longer than the pedicels. Calyx hairy, lower teeth linear-lanceolate. Legume erect, linear-lanceolate, silky.

Rocky places on primary formations from 6200–8200 feet. July, August.

Distribution.—Eastern Alps, and in Valais from the Simplon to Val Ferret.

Oxytropis pyrenaica G. and G.

This species closely resembles *O. neglecta* Gay, but has more numerous leaflets, a more compact head of blue flowers, and shorter, more triangular calyx-teeth. The pod is usually rather broader.

Pastures and rocky places in the Pyrenees and Northern Spain. July, August.

This species seems to be well known in cultivation, but several of the others are just as good. It likes gritty sand and leaf-mould, and should be planted between stones in an open part of the rock-work in a sunny aspect. Most species can be treated in much the same way, in sandy loam with plenty of stones and good drainage below. They can be increased either by seed or by division.

Hedysarum obscurum L.

Stem 6–12 inches high, erect, simple, glabrous, or with scattered hairs. Raceme usually long-stalked, terminal, with sometimes a secondary axillary raceme. Leaves pinnate; leaflets ovate or lanceolate, entire, obtuse, or acute. Stipules membranous, opposite the leaf, 2-cleft. Calyx, peduncle, and pedicles shortly hairy. Flowers large, bright reddish purple, somewhat crowded, pendent. Legume 1–4 chambered, finely downy or glabrous, pendent.

Stony pastures and steep mountain-sides and ravines on limestone or schist, 4000–9000 feet, though usually at from 5000–7000 feet; often somewhat solitary. July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees to Nova Zembla; Caucasus.

CORONILLA L.

Small shrubs with yellow flowers in axillary umbels. Calyx shortly campanulate. Petals with long claws. Keel acuminate. Legume nearly straight, cylindrical, or 4-angled. Leaflets often with white margins.

A small genus of about 20 species, inhabiting Europe, Western Asia, and North Africa.

Coronilla vaginalis Lamk.

A low shrub with leaflets in 3–7 pairs. Flowers small in umbels of 4–10 on a peduncle once or twice the length of the leaf. Stipules in the form of a bifid sheath. Pods pendent, 20–30 mm., straight, divided horizontally into 3–6 oval chambers, with 6 angles.

Rocky places on limestone mountains, from the plains up to 6500 feet. June to August.

Distribution.—Mountains of Central and Southern Europe, extending north to Bohemia and the Harz Mountains.

Coronilla Emerus L.

A shrub 1–2 yards high. Leaflets oboval, truncate, in 2–4 pairs. Flowers large, 2–4 on a peduncle. Legume long, straight, and divided into 7–10 chambers.

Woods and hills, especially on limestone, up to 6000 feet. April to June. On the Riviera it flowers earlier.

Distribution.—Central and Southern Europe, Norway.

Coronilla minima L.

There is an illustration[1] of this pretty little dwarf species, but it cannot be considered Alpine. It frequents sunny hills in Canton Valais and throughout France, Spain, and Italy, but we do not remember having seen it above about 1000 metres. The stem is woody and spreading, leaflets in 3–5 pairs, and the flowers form elegant heads of from 3–6 in each. It is a most useful creeping plant for sunny places on rockeries; and it is as partial to limestone as *Hippocrepis commosa*, which is another much cultivated lowland plant, sometimes found up to 6000 feet in the Alps.

Onobrychis montana DC.

Is perhaps an Alpine variety of the common *A. sativa* Lamk. (Saintfoin), with very beautifully veined crimson flowers, but varying much in depth of colour. The stem is sub-decumbent, and the leaflets short, in 5–7 pairs.

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[1] Omitted for want of space.

Alpine pastures up to 6500 feet in the Eastern, Central, and Western Alps. June to August.

Orobus luteus L. (*Lathyrus luteus* (L.) Peterm.).

Stem 1–2½ feet high, angular, usually simple. Leaflets usually in 4 pairs, rather acute, sea-green, and opaque on the under side. Flowers at first yellowish white, then bright yellow, and finally yellowish brown. Style linear, bearded at apex.

Woods and pastures of the Alps and sub-Alps up to 6000 feet, as, e.g., near Lautaret; very local. May to July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Corbières, Pyrenees; Siberia, Dalmatia.

Lathyrus vernus Bernh. (*Orobus vernus* L.).

Common in mountain woods on limestone throughout Europe, but rarely above 5000 feet. Leaflets oval, acuminate.

VICIA L.

Mostly annuals, and either climbing or procumbent. Leaves with many entire or emarginate leaflets, usually ending in a tendril. Stipules half sagittate. Flowers in axillary racemes. Wing-petals adnate to the keel. Style inflexed, cylindrical or flattened. Ovules usually many. Legume compressed, 2-valved.

A large genus of about 120 species inhabiting the northern hemisphere and South America. The nomenclature of certain groups is obscure and vague, and the genus has never been monographed.

Vicia pyrenaica Pourr.

A small perennial species about 4–6 inches high. Stem ascending. Lower leaves have 1–2 pairs of obcordate leaflets, upper have 4–6 pairs of wedge-shaped leaflets, truncate. Stipules entire. Flowers rich violet, large, axillary, solitary, subsessile. Calyx glabrescent, with almost equal teeth, shorter than the tube. Standard very large. Pod broadly linear, glabrous, blackish when ripe. Seeds brown.

Pastures up to 6500 feet. June, July.

Distribution.—Pyrenees, Spain, Hautes-Alpes and Basses-Alpes.

Quite suitable for planting in sunny, open positions on the rockwork, care being taken that it is not swamped by stronger plants. A sandy, gravelly loam would suit it best.

Among other species occasionally seen in Alpine regions are:—

Vicia pisiformis L.

A large climber with big oval leaflets in pairs of 4 or 5, and rather small greenish yellow flowers.

It grows in limestone woods, but is rare in the Alps, though widely spread in Central and Eastern Europe.

Vicia sylvatica L.

This British Vetch is occasionally met with as high as 6500 feet

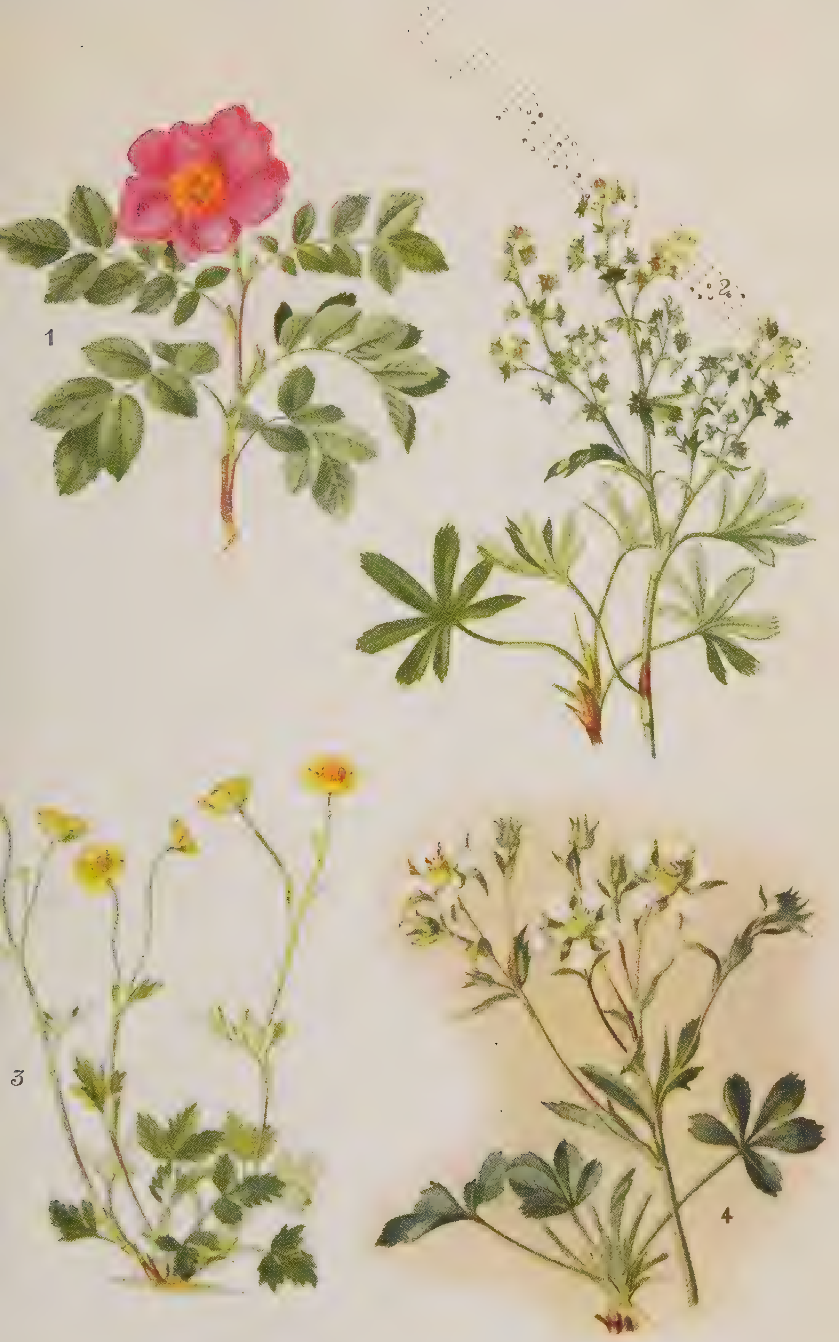

PLATE XIX.

1. Rosa alpina L.
2. Alchemilla alpina L.
3. Potentilla nivea L.
4. Potentilla caulescens L.

in Switzerland, as e.g. below the Trübsee near Engelberg, where it assumes a dwarf, tufted habit and grows with *Hedysarum obscurum* and *Lilium Martagon* on a steep, stony slope.

It is useful for planting at the back of a rockery, and can be allowed to fall over a bank or rock.

Vicia Cracca L.

A very dwarf Alpine form grows in the pastures at Mont Cenis and elsewhere at about 6500 feet. It is only six inches high.

ROSACEÆ

Herbs, shrubs, or trees with mostly alternate leaves, usually toothed or divided, the stipules seldom wanting, and often leaf-like. Flowers in cymes, or solitary at the end of the year's shoots, or more rarely in lateral bunches. Sepals 4 or 5, united at the base into a lobed calyx. Petals 4 or 5, or rarely more. Stamens numerous, inserted with the petals on the calyx below its lobes. Ovary of 1, 2, or more carpels. As the fruit enlarges the carpels either remain free or are combined with each other or with the calyx. Few seeds in each carpel, generally 1 or 2.

A numerous family widely spread over the globe, but more in the northern hemisphere than within the tropics.

ALCHEMILLA L.

Tufted herbs, annual or with a perennial, almost woody, rootstock and annual flowering stems, palmately lobed or divided leaves, and small green flowers in loose panicles or in small sessile heads. Calyx free, double, i.e. of 8 divisions, of which 4 alternate ones are outside and smaller. No petals. Stamens 4 or less. Carpels 1 or 2, 1-seeded.

A small genus widely spread over the northern hemisphere, chiefly in mountainous districts.

Alchemilla alpina L. (Plate XIX.)

Stem prostrate or ascending, branched, covered like the leaves with adpressed hairs. Leaves palmate, 5–9 partite, dark green on the upper side, silver-grey, with shining silky hairs on under side. Segments wedge-shaped, obtuse, serrated. Greenish yellow flowers in a terminal branched, often racemose cyme.

Pastures and rocky places in the mountains up to 9000 feet. July, August.

Distribution.—Central and Western Europe (British). Arctic regions.

Alchemilla pubescens Bieb.

Stem about 6 inches high, covered with soft hairs like the whole plant. Root-leaves reniform, deeply 7–9 lobed. Lobes shortly obovate, cut, entire at the base, but sharply serrate at the apex.

Mountain pastures, especially on limestone, up to 7000 feet. June, July.

Distribution.—Central and Northern Europe, Caucasus, Pyrenees.

Among other species of *Alchemilla* often met with in the Alps are *A. saxatilis* Buser, *A. cinerea* Buser, *A. flabellata* Buser, *A. montana* Willd., *A. pentaphyllea* L. (a distinct, creeping species found in wet places up to 9000 feet), and *A. vulgaris* L. Dr. Buser of Geneva is the great authority on the genus.

Alchemillas are of little value in the garden except for their pretty foliage. Light, sandy soil in an open situation suits them, and they can be easily increased by division.

Sibbaldia procumbens L.

A very dwarf little shrub with procumbent stem an inch or two high. Leaves trifoliate; leaflets cuneate, 3-toothed at the top. Flowers in terminal cymes, small, yellow. Outer sepals and petals 5–7. Stamens 4–10. Achenes 4–10, glabrous, on a hairy receptacle.

High pastures, chiefly on the primitive rocks; 6500–10,000 feet. July, August.

Distribution.—Mountain chains of Central and Northern Europe, Corsica, Pyrenees; Arctic Europe, Asia and America; Scotch Highlands. (Sibbald was a Scotch naturalist and medical doctor of the seventeenth century.)

Potentilla L.

Herbs with perennial tufted stock and often creeping runners. Flowering-stems usually annual. Leaves of 3 or more digitate, distinct segments. Peduncles 1-flowered, solitary or forming a dichotomous cyme. Calyx free, double, i.e. of twice as many divisions as there are petals. Petals 5, or rarely 4. Stamens numerous. Carpels numerous, small, 1-seeded, crowded on a receptacle, which never becomes succulent.

A large genus extending over the whole of the northern hemisphere without the tropics, penetrating the arctic regions, and descending the Andes to their extremity.

Potentilla caulescens L. (Plate XIX.)

Stem weak, prostrate, ascending or erect, many-leaved, cymosely branched at the apex, many-flowered, covered with patent hairs like the leaf-stalks. Root-leaves and lower stem-leaves palmately 5-partite, the root-leaves shorter than those of the stem; upper stem-leaves tripartite, passing into bracts. Segments elongated or wedge-shaped, serrated above the middle, silky-villous below and at the margin. Petals narrow, wedge-shaped, white. Stamens and carpels hairy.

Calcareous Alpine and subalpine rocks up to 8000 feet. July, August.

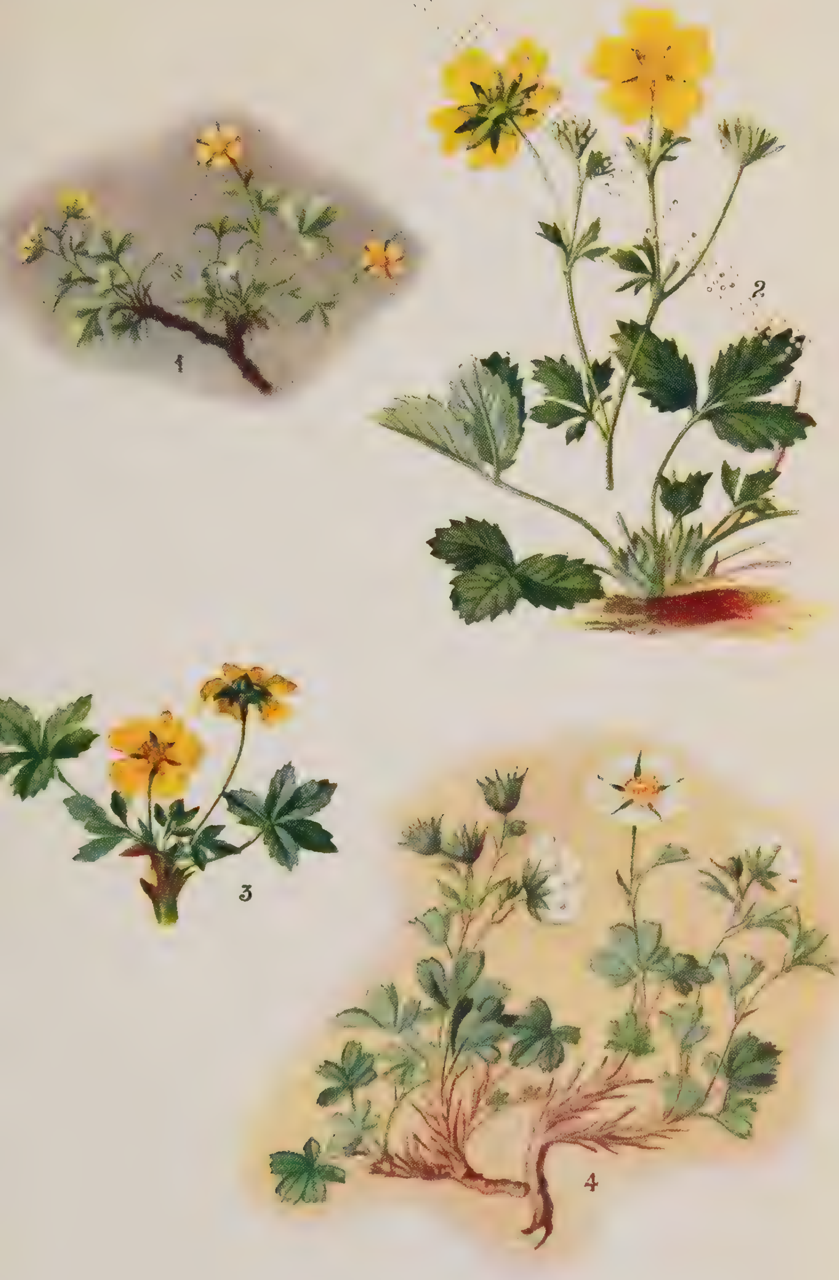

PLATE XX.

1. Potentilla minima Hall. fil.
2. Potentilla grandiflora L.
3. Potentilla aurea L.
4. Potentilla Clusiana Jacq.

Distribution.—Carpathians, Jura, Eastern, Central, and Western Alps, Pyrenees.

Potentilla valderia L.

Densely tomentose. Crown of root covered with silky hairs. Leaflets 5–7, obovate, wedge-shaped, serrated, velvety on both sides. Corymb compact. Petals obcordate, white, shorter than calyx. Filaments hairy. Calyx-teeth lanceolate, acute.

Rocky places and pastures in the Maritime Alps and Balkan provinces; rare. July, August.

Potentilla clusiana Jacq. (Plate XX.)

Rootstock woody, with thick fibres, many-headed. Stem filiform, ascending, 1–3 leaved, 1–5 flowered, covered with patent hairs. Root-leaves palmately 5-cleft, shortly stalked, shorter than stem; stem-leaves 3–5 cleft, smaller, segments lanceolate or wedge-shaped, entire or with 3–5 teeth near the apex, nearly glabrous on both sides or silky on lower side and margin. Flowers handsome, milk-white; petals obovate, longer than calyx-teeth. Filaments glabrous. Capsule villous. Stem and calyx usually tinged with purple.

Clefts of rock and debris in the Eastern Alps. Generally on limestone and rather rare; 5200–6500 feet. July, August.

Potentilla nivalis Lapeyr.

Woolly. Stem ascending, flexuous, covered with long, spreading hairs. Radical leaves digitate, 5–7 segments, oboval, wedge-shaped, green and velvety on both sides, toothed at the apex; stem-leaves digitate. Flowers white, in a dense corymb. Petals shorter than calyx, slightly emarginate; the linear lobes of the calyx extending beyond the petals. Carpels hairy.

Rocks and debris in high mountains up to 8400 feet (Galibier). July, August.

Distribution.—Pyrenees, Spain, Dauphiny, Provence.

Potentilla nivea L. (Plate XIX.)

Stem 3–6 inches high, ascending, 1–2 leaved, few-flowered. Leaves mostly radical, trifoliate; leaflets narrow, deeply cut, and serrated, covered with a dense felt of white hairs on lower side. Flowers yellow, small. Petals longer than the woolly calyx.

Clefts of rocks and stony places in the higher Alps. June, July.

Distribution.—Eastern and Western Alps and Switzerland; Asia, North America, Greenland, Spitzbergen.

Potentilla multifida L.

Stem ascending, 6–12 inches high, branched above. Leaves pinnate, covered on under side with silvery, silky hairs; pinnæ few, deeply pinnatifid, lobes linear. Flowers rather small, yellow, 2–7 in a terminal cyme. Petals obovate, wedge-shaped, emarginate.

Stony places on the Alps and lower Alps, on primary rocks. June to August.

Distribution.—Western Alps, rare in Switzerland, Caucasus, Russia, Siberia, Lapland, Thibet.

Potentilla Saxifraga Ardoino.

A small, tufted species, with branched stem, radical leaves digitate, with 5 lanceolate segments, irregular, glabrous above, silky and silvery beneath, with margin rolled in, and 3–5 unequal teeth at apex. Petioles long and slender. Stem-leaves few, with 2–3 segments. Flowers white, on long, slender pedicels. Obovate petals, longer than the calyx. Carpels hairy.

Limestone cliffs in the Maritime Alps; from about 2200 ft.; rare. May, June.

Potentilla nitida L. (Plate XXI.)

Stem 1–3 inches high, usually 1-flowered. Leaves trifoliate, with elliptical segments, covered on both sides with a felt of silky hair, 3-toothed at the apex. Filaments glabrous. Achenes very villous. Flowers a beautiful pink, or peach-coloured, large. Forms dense cushions.

Dry rocks, especially on limestone; rare or local. July, August.

Distribution.—Eastern and Western Alps; not in Switzerland; Savoy, Dauphiny, Piedmont, Tyrol, Carinthia, Carniola, Styria, and Bosnia.

Potentilla aurea L. (Plate XX.)

Rootstock woody and tufted. Stem erect or ascending, covered with adpressed hairs like the whole plant, branched above, several-flowered. Leaves few, palmately 5-partite, or the upper one tripartite; segments obovate or wedge-shaped, deeply veined above, grass-green and shining, with pale, long silky hairs on the under side, and deeply serrated. Flowers large, bright yellow, with an orange streak at the base. Achenes glabrous.

Abundant in Alpine and subalpine pastures up to 9000 feet (Aig. du Goléon). June to September.

Distribution.—Jura, Carpathians, Eastern, Central, and Western Alps; Cevennes, Corbières, Pyrenees.

Potentilla grandiflora L. (Plate XX.)

All the leaves trifoliate. Stem erect, 4–12 inches high, branched, 2–5 flowered, covered with long patent hairs. Leaves trifoliate; leaflets obovate, coarsely serrate, woolly beneath. Flowers large, yellow (considerably larger than in *P. aurea*).

Rocky places and pastures in the Alps, 5000–9000 feet; rather rare. July, August.

Distribution.—Eastern, Central, and Western Alps, Eastern Pyrenees.

Potentilla minima Hall. (*P. dubia* Crantz). (Plate XX.)

1–2 inches high, tufted. Stem ascending or erect, covered like whole plant, with hair, with 1 or 2 small yellow flowers. Leaves few, trifoliate, segments obovate, deeply serrated at the apex, glabrous above, covered with adpressed hairs below. Capsule glabrous.

Bare Alpine pastures and screes, and margins of snow-fields, 5500–9100 feet. July, August. Local.

Distribution.—Whole Alpine chain from Dauphiny to Roumania, Pyrenees, Jura (Reculet).

Potentilla frigida Vill.

Leaves trifoliate. Stems prostrate or ascending, 1–3 flowered. Leaves dull green, villous on both sides; leaflets ovate, wedge-shaped, deeply toothed all round. Flowers yellow, rather small. Petals emarginate, slightly longer than the calyx.

Rocky places in the Alps; rare; 7000–8400 feet. July, August.

Distribution.—Eastern, Central, and Western Alps.

The following species are also sometimes seen above 5000 feet in the Alps, viz. *P. verna* L., *P. salisburgensis* Haenke (*P. alpestris* Hall), *P. delphinensis* G. and G. (a fine mass in the Botanic Garden at Lautaret in Dauphiny), *P. heptaphylla* Mill., and *P. rupestris* L.

All the species mentioned are more or less worth cultivating, and most of them require similar treatment, in light, sandy soil, and a sunny aspect. Care, however, should be taken to give lime or chalk to those species which naturally live on limestone. They can all be increased by seed, division, or by cuttings, and might be more grown in England.

GEUM L.

Herbs with a short perennial stock and annual erect stems. Leaves pinnate, with few unequal segments, and yellow, red, or white flowers, growing singly on long peduncles at the ends of the stem or branches. Calyx of 5 equal divisions, with 5 very small outer ones alternating. Petals 5. Stamens numerous. Carpels numerous, 1-seeded, ending in a hairy awn, which is hooked at tip.

A small genus, spread over the temperate and colder regions of Europe, Asia, and North America, and descending along the Andes.

Geum reptans L. (Plate XXI.)

Stem with prostrate runners, 1-flowered, hairy like the leaves. Leaves interruptedly pinnate; leaflets incised, acutely dentate, terminal leaflet 3–5-cleft. Flowers very large, deep yellow. Achenes and their unjointed awns villous and plumose.

Rocks, moraines, and moving debris in high mountains on granite or schist; 6500–12,500 feet. July, August.

Distribution.—Carpathians, Central and Western Alps, Spain.

This is one of the most conspicuous of the very high Alpine plants, and is certainly the one which has the largest flowers. We once saw it at about 11,500 feet on the Combin de Corbassière in Switzerland, and Professor Vaccari records it from 3800 metres on the Grivola, and from 3400 metres on the Furggengrat, which connects the Matterhorn with the Théodulhorn.

G. reptans is rarely to be had from nurserymen, and sometimes *G. montanum* is sold in mistake for it. It should be planted in a moraine, or in any poor and very stony ground among rocks, and be given plenty of water in the growing season, for this it generally gets in nature from the melting snow. It can be increased by division more easily than from seed.

Geum montanum L. (Plate XXI.)

Rootstock more or less horizontal, and with long fibres. Stem erect, about 6 or 8 inches high, villous like the leaves, 1-flowered. Root-leaves lyrate-pinnatifid; segments ovate or roundish, obtuse, unequally crenate, the lower ones much smaller, the terminal one very large, obscurely lobed; stem-leaves small, 3-cleft, dentate. Flowers rather smaller than the last, but very handsome, golden yellow. Achenes forming a nearly globular head, plumose. Regarded by the inhabitants of the Alps as having wonderful properties in healing various diseases.

Pastures and rocky places of the Alps, from 4500 to 9500 feet. Much commoner than the last. June, July.

Distribution.—Carpathians, Balkans, Eastern, Central, and Western Alps; Pyrenees, Corsica.

Very easily cultivated from seed or by division, and it forms a beautiful plant for the rockery. It does not require so much water as *G. reptans*.

Dryas octopetala L. (Plate XXI.)

Stem somewhat shrubby and woody, branched, prostrate, forming flat cushions extending sometimes a couple or more feet from one root. Leaves evergreen, cordate-ovate, crenate, blunt, glabrous, and shining on the upper surface, white and hoary beneath. Stipules lanceolate-subulate, more or less hairy, like the leaf-stalk and flower-stalk; calyx and upper part of flower-stalk with short glandular hairs. Flowers solitary, large, white, terminal. Seed-vessel feathery in fruit. Petals 8–9. Calyx 8–9 lobed.

Rocky places and high pastures, especially on limestone, from 4300 to 9000 feet, and occasionally descending to the plains; frequent. June to August.

Distribution.—Mountain ranges of Europe from the Pyrenees to the Caucasus, Arctic Europe, Siberia; North America; Scotland.

There are only 2, or possibly 3 species of this genus; the present one is found fossilised in parts of Europe.

Very hardy and of easy culture; can be increased from seed or by layers. If *Gentiana verna* be planted with *Dryas*, the two form

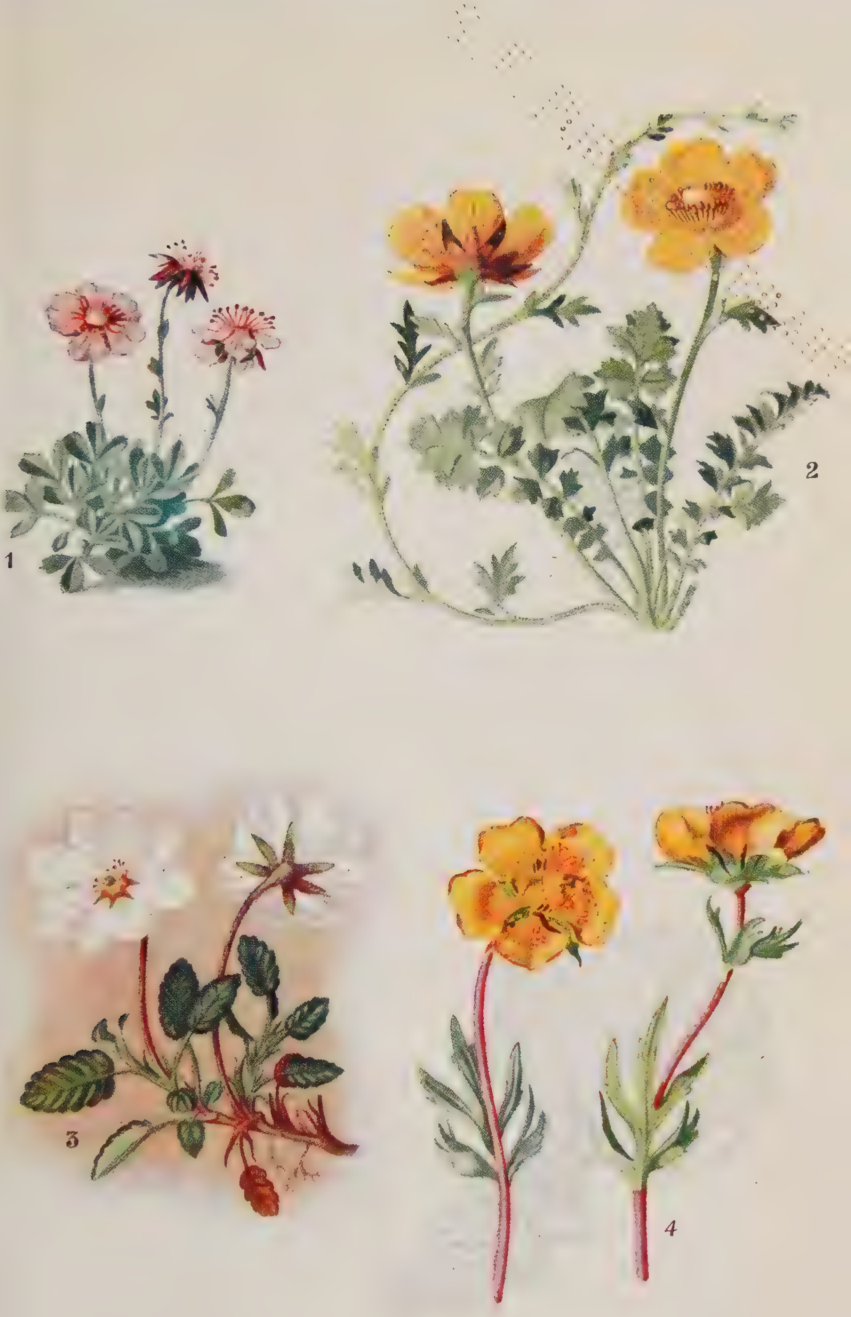

PLATE XXI.

1. Potentilla nitida L.
2. Geum reptaus L.
3. Dryas octopetala L.
4. Geum montanum L.

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a very beautiful combination, which is not infrequently seen in the Alps. *G. verna*, which is a difficult plant to grow in this country, is often helped by some companion, so long as it does not get crowded out by too robust a growth.

ROSA L.

Rosa alpina L. (Plate XIX.)

Stem 1–4 feet high, according to position. Prickles straight, horizontal or pointing downwards, crowded, on the barren shoots, usually wanting on the flowering stems. Leaflets in 3–5 pairs, elliptical, serrate, glabrous or hairy beneath, dark green on upper, lighter on under side. Flowers solitary, deep rose-red, fragrant, the size of an ordinary dog-rose. Calyx-teeth entire, broader near the apex, as long or longer than petals. Hip scarlet, elliptical or rarely globular, and sometimes flask-shaped, fleshy, drooping, crowned by the erect calyx-teeth.

Margins of woods, stony pastures, and bushy places from 3000 to 8000 feet. June, July.

Distribution.—Vosges, Jura, Cevennes, Corbières, Pyrenees; Alpine chain from east to west.

Rosa spinosissima L.

This pretty little spiny shrub, about a foot high in the mountains, with creamy white blossoms, sometimes ascends a considerable height in the Alps, though found at sea level in England and Wales. The writer gathered it at 7000 feet on rocks above Lans-le-bourg in Savoy. It is very rare in Switzerland, except on the Jura.

Distribution.—Europe, through Western Asia to China and Manchuria.

ONAGRACEÆ

Herbs with opposite or alternate leaves, and often showy flowers, which are usually regular, 4–merous or 2–merous. Calyx lobes 2 or 4, valvate in bud. Petals 2 or 4. Stamens 2–8. Ovary 2–6 celled, when many-seeded with axillary placentation.

A considerable family, ranging over the whole world, but in the greatest variety in North America.

EPILOBIUM L.

Herbs mostly erect, with annual flowering stems and creeping stolons. Flowers axillary or in terminal spikes. Calyx-tube long, slender, with 4-partite limb. Petals 4. Stamens 8. Ovary 4-celled; stigma 4-lobed. Seeds tipped with a tuft of long hairs.

This genus is diffused over nearly the whole world, from the extreme Arctic regions to the tropics.

Epilobium alsinefolium Vill.

Stem erect or ascending, about 6 inches high, simple or branched, with downy ridges running down from the margins of the leaves, otherwise glabrous like the leaves. Lower leaves obovate, obtuse, narrowed into the leaf-stalk, upper leaves larger, ovate or ovate-lanceolate, bluntly acuminate, usually, sessile, opposite, the uppermost narrower and more acute, alternate. Flowers funnel-shaped, in leafy, at first pendent, 1–3 flowered racemes. Capsule glabrous, or with scattered hairs.

Damp, rocky places and Alpine streams, common; up to 9000 feet. July, August.

Distribution.—Mountainous regions of Europe, Asia, and North America.

Epilobium alpinum L. (Plate XXII.)

Allied to the former, but smaller in all its parts and particularly in the flowers. Stem 2–6 inches high, erect or ascending from a creeping base, simple, 2-sided from two downy lines running down from the margins of the leaves, otherwise glabrous like the leaves. Leaves obtuse, entire, or with a few small teeth. Upper leaves lanceolate, alternate. Flowers small, rose-coloured, in the axils of the uppermost leaves. Stigma club-shaped. Capsule glabrous, with a few scattered hairs.

Damp, sandy places by springs and streams, in the Alps and lower Alps up to 8600 feet. July, August.

Distribution.—Mountains of Europe, including the Arctic regions, North America, Central and Northern Asia (British).

Epilobium Fleischeri Hochst.

Sometimes considered a dwarf Alpine variety of *E. rosmarinifolium* Haenke = *E. Dodonæi* Vill. Stem ascending from a creeping and woody base. Leaves linear or narrowly lanceolate, the same colour on both sides, glabrous, not veined. Flowers large and handsome, bright rose-purple. Style hairy up to above the middle, half as long as stamens. A cymose panicle of few flowers. Somewhat variable.

Moraines and sandy, stony places by mountain torrents in the Alps and sub-Alps, on primary formations and siliceous rocks; local and not often seen above 7000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, rare in the Jura.

This is an unsatisfactory and rather difficult plant to get up by the roots, for they penetrate long distances into the sand or gravel and are not substantial. It is better obtained from seed at the end of August. It is the only species worth cultivating among the small ones, and can be easily grown on a ‘moraine’ or in damp, sandy or gravelly soil. However, a mixture of sand and granite chips would suit it best. It must be given plenty of room, as it spreads rapidly.

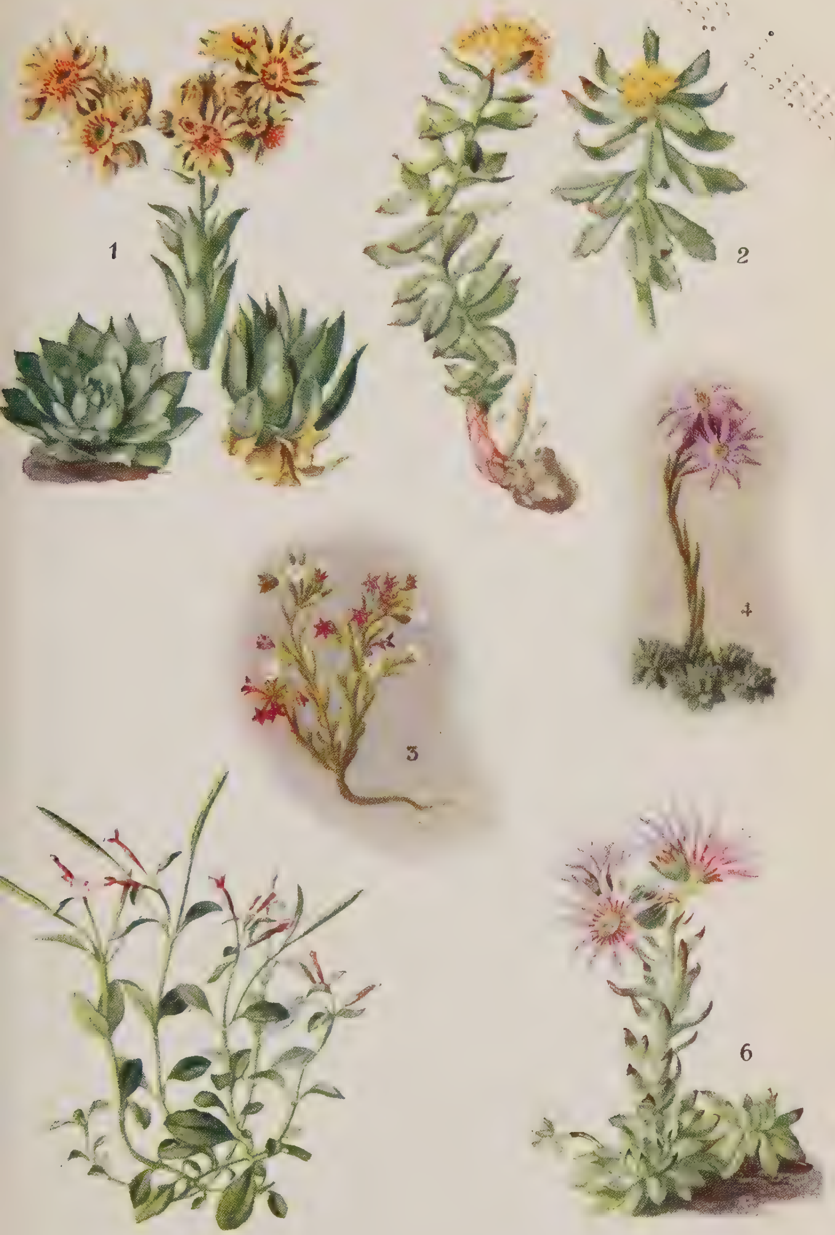

PLATE XXII.

1. Sempervivum Wulfenii Hoppe.
2. Sedum roseum Scop.
3. Sedum atratum L.
4. Sempervivum Dollianum Lehm.
5. Epilobium alpinum L.
6. Sempervivum Funkii Braun.

CRASSULACEÆ

Herbs or shrubs with succulent leaves, mostly alternate; no stipules and flowers in terminal racemes or cymes. Sepals 3 or more, usually 5. Petals as many, sometimes united in a single corolla. Stamens as many or twice as many, inserted with the petals at base of calyx. Ovary superior. Carpels 3–5 or more, usually quite distinct. Ovules numerous, attached to the ventral suture.

A large family, spread over the greater part of the globe.

SEDUM L.

Succulent herbs, sometimes woody at the base, with scattered leaves, sometimes opposite or whorled, especially at the base or on barren stems. Sepals 4–6 (usually 5). Petals as many. Stamens twice as many. Carpels as many as the petals, each with an entire or emarginate scale at the base, and with several seeds.

A large and widely spread genus, especially in Central and Southern Europe and Central Asia.

Sedum atratum L. (*S. rubens* Wulf). (Plate XXII.)

Stem 1–3 inches high, ascending or erect, simple or branched at the base, glabrous like the whole plant, often dotted or streaked with red. Leaves club-shaped, fleshy, obtuse, somewhat flat on upper side. Flowers yellowish, or greenish white, in a terminal, often unilateral, cyme. Calyx reddish brown. Capsule dusky purple, and the whole plant reddish when older. Annual or biennial.

Alpine rocks and dry pastures, 4300–9000 feet or higher. July, August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Pyrenees, Balkan provinces.

Sedum annuum L.

Annual. Quite glabrous and very small. Leaves slender, cylindrical, green. Flowers in elongated cymes, yellow.

Dry, stony places and rocks of primary formation up to 8200 feet. July, August.

Distribution.—Nearly all Europe, Western Asia, Greenland.

Sedum alpestre Vill.

Stem slender, short. Leaves linear, nearly equal. Barren shoots prostrate. Flowers pale yellow, subsessile, in a dense corymb. Sepals oval, obtuse.

Rocks and debris in high granitic mountains, 5500–9000 feet. June to August.

Distribution.—Alpine chain, Vosges, Pyrenees, Corsica, Asia Minor.

Sedum roseum Scop. (*Rhodiola rosea* L.). (Plate XXII.)

Robust, 6–12 inches high. Rootstock tuberous and thick. Stem simple, erect, very leafy. Leaves ovate-elliptical, serrate towards the apex, densely crowded. Flowers small, greenish or reddish, unisexual and diœcious.

Primary rocks, 4000–8000 feet ; local. July, August.

Distribution.—Central and Northern Europe, Siberia, North America (British).

The illustration is the variety *Scopoli* of Kerner.

Several other species can be found in the Alps, including such well-known British examples as *S. album* and *S. sexangulare*, etc. Most useful plants for cultivating on walls and rocks and propagated by division.

SEMPERVIVUM L.

Robust, fleshy herbs, with perfect flowers in panicled or corymbose cymes. Petals and calyx-teeth 6 or more, the petals being distinct or connate. Stamens generally twice as many as petals. Carpels free or connate, adnate to calyx-tube, many-seeded.

About 50 species inhabiting Europe, Asia, and Africa.

Sempervivum Wulfenii Hoppe. (Plate XXII.)

Leaves of the rosettes obovate-lanceolate, suddenly narrowed into a mucro, sea-green, glabrous, ciliated, but margin ultimately glabrous at the apex. Petals linear-subulate, sulphur or greenish yellow, 3 times as long as calyx, hypogynous scales erect, almost square.

Primary rocks in the Eastern Alps, 6500–8500 feet. July, August.

Sempervivum tectorum L. (House-leek.)

Rosettes large, and whole plant robust and often a foot or more high. Rosette leaves suddenly narrowed into a mucro. Stem-leaves broadly linear, spreading. Petals lanceolate or linear, twice as long as calyx-teeth, pink.

Rocks, especially limestone, up to 8200 feet. June to August.

Distribution.—Europe, especially Central ; Caucasus, Persia.

Naturalised in Britain, and generally in Europe, except in the Alps. It was formerly planted on roofs and walls as a supposed protection against lightning.

Sempervivum dolomiticum Facch. (Plate XXIII.)

Rosettes close, of stiff, narrow, linear-lanceolate leaves, gradually acuminate from the middle, with a blunt keel on the lower side, and a few short cilia on the keel, a number of short, stiff cilia on the margin, and stouter ones towards the apex. Petals dark red, expanded in a star, linear-lanceolate, twice as long as segments of calyx. Stem 4–5 inches high, usually dark red, like the tips of the leaves. Rosettes surrounded by the dead, ashen-grey leaves of the previous year.

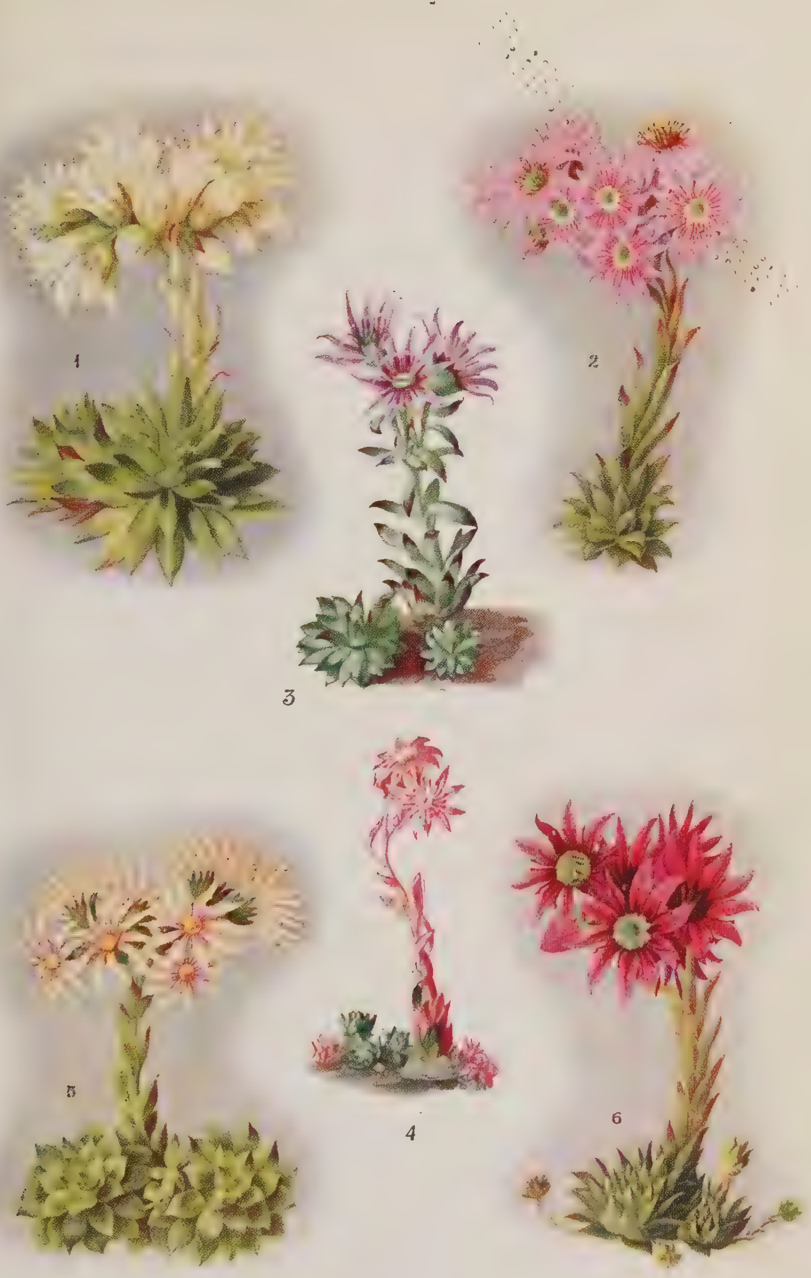

PLATE XXIII.

1. Sempervivum arenarium Koch.
2. Sempervivum fimbriatum Schott.
3. Sempervivum montanum L.
4. Sempervivum arachnoideum L.
5. Sempervivum Huteri Hsm.
6. Sempervivum dolomiticum Facch.

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A few rocky spots in the Dolomites and Tyrol; rare; at about 6500 feet. July, August.

Sempervivum fimbriatum Schott. (Plate XXIII.)

Rosettes somewhat loose, of linear or oblong acuminate leaves, rather soft, nearly glabrous on both sides, with long, soft, crinkled cilia at the margin, somewhat matted in young leaves. Petals lanceolate, pale to dark rose-red, 2½–3 times length of segments of calyx. Stem 6–10 inches high. Readily distinguished from *S. montanum*, with which it is often associated, by its broader petals and the acute rosette leaves with long cilia.

Stony, rocky places in the argillaceous Alps of Tyrol and Carinthia, from 8000 to 10,000 feet. July, August.

Sempervivum arenarium Koch. (Plate XXIII.)

Rosette leaves lanceolate, narrowing gradually from the middle to the apex, acute. Lower stem-leaves ovate-lanceolate from a broader, somewhat cordate base, uppermost nearly triangular-ovate; all ciliate at the margin, but glabrous on both sides. Flowers campanulate, whitish. Petals 3 times as long as calyx, keel torn into shreds.

Sandy, woody places at about 5000 feet, on primary rocks; rare. July, August.

Distribution.—Southern Tyrol, Salzburg, Carinthia.

Sempervivum Döllianum Lehm. (Plate XXII.)

Rosette leaves ovate, acute, with reflexed cilia, otherwise glabrous, with a few tufts of hairs towards the apex, and a web of hairs uniting the apices of the young leaves. Stem-leaves larger, narrowed below. Petals expanded in a star, ovate-lanceolate, acuminate, about 3 times as long as the calyx. Sometimes regarded as a variety of *S. arachnoideum* L.

Rocky places above 5000 feet; rare. July, August.

Distribution.—About Bozen in Tyrol and in Carinthia.

Sempervivum arachnoideum L. (Plate XXIII.)

Rosettes with lanceolate or obovate leaves, abruptly acute, covered with short glandular hairs, stiffly ciliated, bearded at the apex, with radiating, spider's web-like hairs, uniting the ends of the leaves. Petals narrowly lanceolate, acuminate, 3 times as long as the calyx, rose-red, sometimes with a darker streak. The stem and stem-leaves often reddish.

Rocks of the Alps and sub-Alps, 4000–9500 feet; widely spread but local, and much rarer on limestone than siliceous rock, e.g. it has not been recorded from the whole range of the Jura, where its place is taken on the Reculet, etc., by a somewhat similar species, *S. Fauconneti* Reuter, intermediate (though not a hybrid) between this and *S. montanum*.

S. arachnoideum sometimes covers the rocks in immense masses, and the rosettes are often quite white with 'spiders' webs.'

Distribution.—Carpathians, Eastern, Central, and Western Alps, Pyrenees, Central Plateau of France, Cevennes, Corbières, Apennines.

Sempervivum montanum L. (Plate XXIII.)

Rosettes with lanceolate-wedge-shaped, shortly acuminate leaves, glandular-villous on both sides, obscurely ciliated with longish hairs. Stem-leaves lanceolate, somewhat broader towards apex. Petals lanceolate-subulate, very acute, 3 or 4 times as long as the calyx, deep lilac, with a darker streak.

A taller and more robust plant than the last, and less common, though widely spread on primary rocks, and especially on the isolated blocks of rock called 'Befen.' It reaches 9600 feet, and rarely descends into the valleys.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Pyrenees, Corsica.

Sempervivum hirtum L.

Rosette-leaves linear-lanceolate, acute, ciliated, but glabrous on both sides; stem-leaves crowded, sessile, ovate-lanceolate from a cordate base, acuminate, ciliated, shortly hairy, the lower leaves often glabrous. Flowers yellowish, campanulate, in terminal, unilateral cymes. Petals usually 6, erect, linear-lanceolate, fringed at the margin, twice as long as the calyx, which is usually 6-parted. Carpels usually 6.

Rocks and stony, grassy places in the high mountains. July to September.

Distribution.—Carpathians, Eastern and Western Alps; not in Switzerland; Erzgebirge, Eastern Pyrenees.

Sempervivum Huteri Hausm. (Plate XXIII.)

Rosette-leaves elongated, wedge-shaped, twice as long as broad, partly folded, yellowish green, glandular-downy on both sides, shortly ciliated. Petals expanded in a star, narrowly lanceolate, feathery, nearly 3 times as long as calyx segments, yellowish at tips, tinged with dirty red at the base. Distinguished from *S. Wulfenii*, which is usually found in company with it, by its lower habit (3–6 inches), the yellowish green of the rosettes, and the glandular-downy hair; and from *S. montanum* by the stiff apex of the leaves, and the dusky variegation of the petals.

Rocky, stony places on the argillaceous Alps; rare. July, August.

Distribution.—Eastern Alps, particularly in Tyrol and Carinthia.

Sempervivum Funkii Braun. (Plate XXII.)

Rosette-leaves lanceolate, shortly acuminate, glandular-villous on both sides, and ciliated with stout, long hairs. Stem 3–5 inches high. Leaves bright green, even in the autumn, numerous, mucronate. Petals expanded like a star, rose-red, lanceolate, acuminate, nearly 3 times as long as the calyx. Stamens 10. Ovary broadly ovate, nearly lozenge-shaped.

Sunny, rocky places in the Alps, 5500–7000 feet. July, August.

Distribution.—Eastern Alps (Salzburg, Tyrol, and Carinthia); Carpathians; local.

Sempervivum Pittonii Schott and Kotschy.

Rosette-leaves tongue-shaped, shortly acuminate, covered with long hairs. Stem-leaves glandular-hairy, linear-lanceolate, ciliated, covered with soft hairs. All leaves have a purple patch at the apex. Petals pale yellow. Stamens same colour. Ovary obliquely ovate.

On serpentine rocks near Kraubat, Styria; very rare.

Sempervivums are most attractive plants for walls and rockeries, and they are readily increased by division of the off-shoots. They are all of very easy culture in any light soil in hot aspects, and may be grown on almost any kind of rock. They can be attached to rock by means of fairly moist clay laid on the stone and the plant dibbled in, and they will soon grow and make a good clump.

SAXIFRAGACEÆ

Herbs (in Europe) with alternate or opposite leaves, and no stipules. Calyx free, or more or less adherent to the ovary, with 4 or 5 lobes or segments. Petals as many, perigynous, or none. Stamens as many, or twice as many, perigynous. Ovary 1–3 celled. Ovules numerous, on axillary placentæ. Fruit a 2–4 celled capsule. Seeds usually many.

An extensive family, ranging over nearly the whole world.

Saxifraga L.

Herbs, mostly with a perennial tufted stock, with radical or alternate or sometimes opposite leaves, no stipules. Flowers terminal, solitary, or in cymes or panicles. Calyx free or partly adnate to the ovary. Ovary 2-lobed, 2-celled. Styles 2. Capsule 2-valved, 2-beaked.

A large genus of about 200 species and many varieties, chiefly mountain or rock plants, found in all the great mountain chains of the northern hemisphere, some extending to the further Arctic stations, and thus along the Andes to the Antarctic circle, and a few descend to the hot limestone rocks of the Mediterranean region.

The genus was monographed by Professor Engler of Berlin, while other botanists have specialised in sections of it.

Saxifraga cernua L. (Plate XXIV.)

Stem erect, slender, simple, 2–3 inches high, bearing one terminal, drooping white flower. Root-leaves reniform, palmately 5–7 lobed, stalked, upper stem-leaves sessile, the uppermost entire, bearing little bulbils in their axils. Petals obovate.

On overhanging rocks and damp, shady declivities in the high Alps; rare. July, August.

Distribution.—Carpathians; Eastern and Central Alps, very rare in Switzerland, and on one Scotch mountain. Northern Asia and all round the Arctic circle.

Saxifraga hieracifolia W. and K. (Plate XXV.)

Leaves in a radical rosette, ovate or obovate-lanceolate, large, 2–4 inches long, paler green below, narrowed into a foot-stalk, very finely rusty-glandular, especially on the midrib. Scape angular, nearly simple, paniculate above, panicle compact. Petals light green, with purple margin, ovate, acute, as long as the ovate-spreading sepals. Anthers red.

Shady, damp places rich in humus; rare. July, August.

Distribution.—Carpathians; Eastern Alps, Pas de Roland in France, Norway, Spitzbergen, Arctic Russia and Siberia, North America.

Saxifraga petræa L. (Plate XXIV.)

Stem solitary, decumbent, leafy, paniculate. Flower-stalks 1-flowered, with 2 bracts. Leaves pinnately 3-cleft, inciso-dentate, lower leaves nearly reniform; uppermost wedge-shaped at base, entire or 3-cleft, the lobes acuminate. Leaf-stalk of lower leaves elongated, furrowed. Petals white, obovate, twice as long as calyx.

Damp, rocky places on limestone, often descending to a low elevation; 2000–5300 feet. May to July.

Distribution.—Carpathians, Eastern Alps; rare.

Saxifraga arachnoidea Sternb.

Stem 2–4 inches high, procumbent or ascending, branched, covered with long hairs. Leaves shortly stalked, wedge-shaped, bluntly dentate or indented. Petals lemon-yellow, scarcely longer than the calyx. Whole plant covered with spider's web-like, white glandular hairs.

Shady, rocky places, 6500–9000 feet; rare. July, August.

Distribution.—Tyrol, on Dolomitic limestone.

Saxifraga rotundifolia L. (Plate XXIV.)

Stem erect or ascending, leafy, terminating in a loose paniculate, glandular-downy cyme. Leaves hairy, cordate-roundish or reniform; root-leaves and lower stem-leaves long-stalked, coarsely dentate, uppermost sessile, broadly wedge-shaped, and unequally cut. Calyx-teeth spreading. Flowers star-like, milk-white, spotted with red above and yellow below the middle. Petals narrowly lanceolate.

Damp Alpine and subalpine woods and shady places, from 3000 to 7000 feet. June to August.

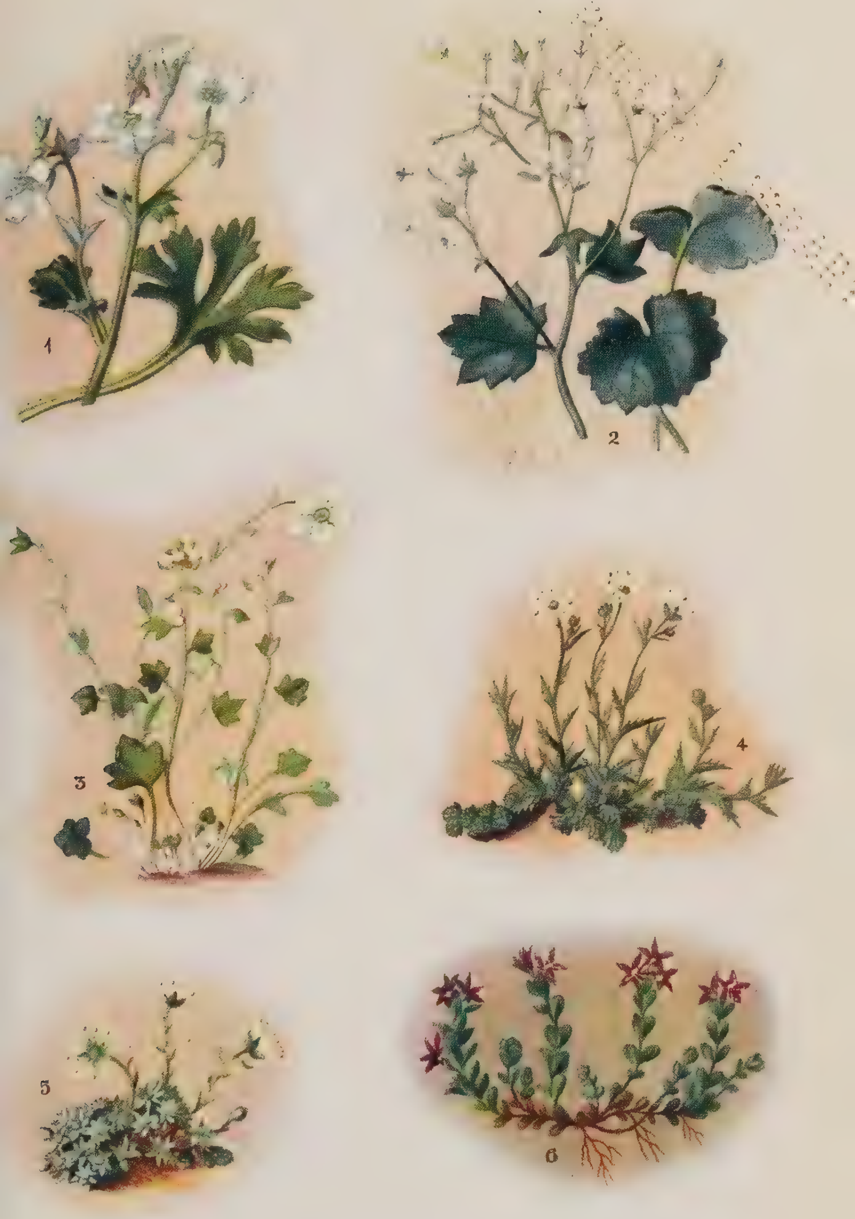

PLATE XXIV.

1. Saxifraga petræa L.
2. Saxifraga rotundifolia L.
3 Saxifraga cernua L
4. Saxifraga aspera L.
5. Saxifraga bryoides L.
6. Saxifraga biflora All.

Distribution.—Alps, Pyrenees, Central and Southern Europe, Corsica, Caucasus, Asia Minor, Armenia.

Saxifraga paradoxa Rchb. (*Zahlbrucknera paradoxa* Rchb.).

Stem prostrate. Leaves distant, lower ones long-stalked, cordate-reniform, 5–7 lobed, lobes obtuse or shortly acuminate; upper leaves 3-lobed. Flowers solitary, at length long-stalked. Petals green, shorter than the sepals. Calyx half inferior; the small calyx-teeth narrowly lanceolate, acute.

Damp rocks, especially overhanging slabs of gneiss, preferring the darkest corners of the hollows; 3300–6000 feet; rare.

Distribution.—Only in Western Styria, Carinthia, Southern Tyrol, and on the border between Tyrol and Lombardy.

Saxifraga controversa Sternb.

A small annual species 1–3 inches high, like a robust and large-flowered *S. tridactylites*, and, like it, covered with viscous pubescence. The stem is thick, ascending, and branched. Radical leaves spathulate, or slightly 3-lobed, forming a small rosette; the stem-leaves are distinctly 3-cleft and spathulate. Flowers milk-white, on thick pedicels, dilated at the summit, about equalling the calyx in length. Sepals broadly oval, equalling the oboval tube. Petals twice as long as the calyx.

Moist, rocky places on high pastures up to 10,000 feet. June to August.

Distribution.—Alps, especially Western and Central, Pyrenees, Bithynia; Caucasus; North America.

Saxifraga nivalis L.

Perennial stock short, thick, and simple, crowned with a tuft of spreading obovate, rather leathery leaves, narrowed into a stalk at the base. Stem simple, thick, 2–5 inches high, usually leafless. Small white flowers in a dense terminal head. Calyx segments shortly oblong and spreading.

Summits of mountains in Northern and Arctic Europe and Asia, in the highest Bohemian mountains, and in the British Isles, as on Snowdon and some of the Scotch peaks.

Saxifraga Hirculus L.

Perennial stock often reduced to a mere tuft. Leaves alternate, almost linear, entire. Flowering stems ascending to about 6 inches, leafy, and terminating in a large, single yellow flower, with narrow-obovate or oblong petals. Capsule rather large. Calyx segments reflexed, not half the length of the petals.

Sphagnum bogs and wet mountain moors. July, August.

Distribution.—Jura, rare in Switzerland, Central, Northern, and Arctic Europe; Caucasus, Thibet, Himalaya; North and Arctic America. Rare in Britain.

Saxifraga stellaris L. (Plate XXV.)

Stem erect, 1–4 inches high, leafless with exception of the bracts, bearing a 3- or more-flowered cymose corymb, covered, like the whole plant, with scattered glandular hairs. Leaves forming a loose rosette, grass-green, wedge-shaped or obovate, coarsely serrate near the apex. Calyx with revolute teeth. Petals lanceolate, rather acute, and small, expanded like a star, white, with 2 yellow spots at the base. Anthers vermilion-red.

Damp, shady rocks, and exposed mountain tops and Cols near the snow; 4000–8500 feet. Common on primary rocks. It grows at the extreme summit of Ben Nevis, the highest point in the British Isles. July, August.

Distribution.—Mountains of Central and Northern Europe, as far as the Arctic Circle; Alps, Pyrenees, Vosges, Cevennes, Siberia, North America, British Isles.

S. stellaris var. *robusta* Engler (*S. Engleri* Dalla Torre) appears to be a strong form of *S. stellaris* with unequal petals, found in Switzerland and Tyrol. We have such a form also from Norway, with very thick and large leaves.

Saxifraga umbrosa L. (London Pride.)

This well-known plant grows in damp, mountainous places in subalpine localities, and is much cultivated, and often naturalised. It is truly wild only in the Pyrenees, Corsica, north of Spain and Portugal, and the south-west of Ireland, where it ascends the summit of Carrantual, the highest mountain in Ireland (3414 feet). There are several varieties.

Saxifraga hirsuta L. and *S. Geum* L. are somewhat similar to the last, but the leaves are longly petioled, and nearly round, with a heart-shaped or almost truncate base, instead of being oval and elongated into a leaf-stalk, as in *umbrosa*. The geographical range is similar to that of *S. umbrosa*, but they are found usually at lower altitudes.

Saxifraga cuneifolia L. (Plate XXV.)

Stem 4 inches to a foot high, very brittle; shoots in a series of rosettes one above the other. Leaves roundish-obovate, wedge-shaped, or spathulate, very obtuse, wavy crenate, quite glabrous, with cartilaginous margin. Leaf-stalk flat, wedge-shaped, glabrous. Inflorescence paniculate. Calyx-teeth recurved. Petals milk-white, with 2 coalescent yellow spots. Filaments broader upwards.

Damp, shady woods and rocks, and steep, rocky declivities of the lower Alps, 3000–6500 feet; local, but sometimes covering rocks and banks in woods with enormous mats. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Cevennes, Pyrenees, Corbières, Spain, Apennines.

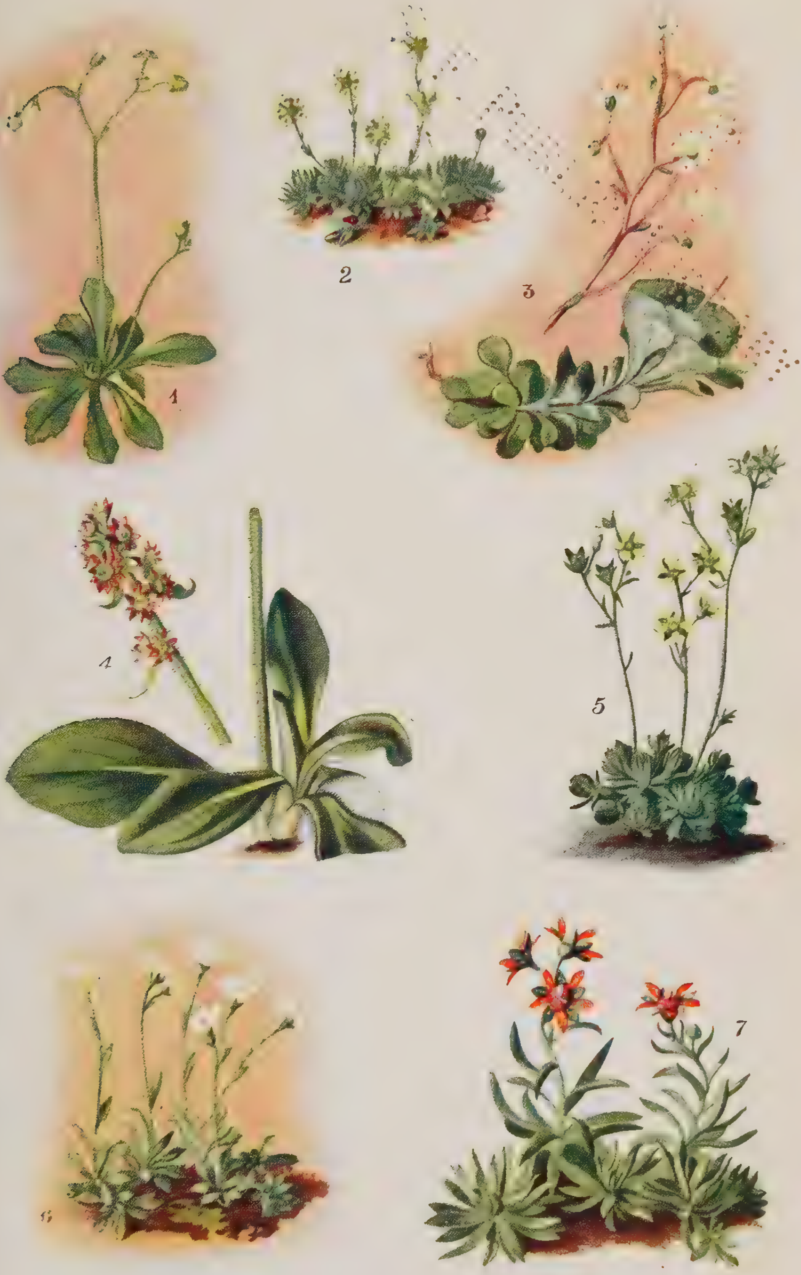

PLATE XXV.

1. Saxifraga stellaris L.
2. Saxifraga Seguieri Spr.
3. Saxifraga cuneifolia L.
4. Saxifraga hieracifolia W. et K.
5. Saxifraga moschata Wulf.
6. Saxifraga androsacea L.
7. Saxifraga aizoides L.

[illegible]

A very useful plant for covering rocks or unsightly banks, or old walls in the shadier parts of the rock garden.

Saxifraga aspera L. (Plate XXIV.)

Stem with prostrate, tufted branches. Leaves on fertile stem, and barren shoots spreading, stem-leaves rigid, linear-lanceolate, with stiff cilia, entire. Stem 3–7 flowered, about 6 inches high. Flowers pale yellow. Calyx patent. Anthers yellow.

Rather moist, stony places on the primary rocks; 3300–8000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Spain.

Saxifraga bryoides L. (Plate XXIV.)

Shoots tufted, elongated, 1–2 inches long, usually prostrate. Stem 1–2 inches high, with solitary yellowish white flowers. Leaves linear-lanceolate, with a stiff awn, ciliated, with one dot on the upper side near the apex; stem-leaves rather close, erect, adpressed to the stem. Calyx spreading, with somewhat mucronate teeth. Anthers orange. Sometimes considered a sub-species of the preceding.

Moraines, and damp, stony places and fissures in the siliceous and primary rocks, from 7000–12,200 feet, and therefore one of the highest Alpine plants (3630 metres on Monte Rosa and 3700 metres on the Grivola).

Distribution.—Carpathians, Sudetic Mountains, Eastern, Central, and Western Alps; Pyrenees.

Saxifraga retusa Gouan.

A small, prostrate species with branched, tufted, very leafy, pubescent stems. Leaves very small, with 3–5 pits at the tip. Stem-leaves opposite, imbricate, in 4 rows, spreading or recurved from the centre. Petals light purple, 2–3 on summit of the stem. Sepals glabrous. Petals oblong-lanceolate, pointed, twice as long as the sepals. Plant usually glandular in upper parts.

High, exposed ridges, and *arêtes* on gneiss and granite, from 8200 to 10,900 feet; very local. July, August.

Distribution.—Western and Southern Alps, very rare in Switzerland, Salzburg, Upper Styria, Carpathians, Eastern Pyrenees.

We have found this finest in Piedmont and the Maritime Alps, but it is nearly always on the most exposed Cols and ridges above 8500 feet.

Saxifraga oppositifolia L. (Plate XXVI.)

Stem creeping, much-branched; branches erect, crowded, and densely clothed with opposite leaves, the flowering stems less crowded, 1-flowered. Leaves in 4 rows on the barren stems, spathulate, strongly ciliated, otherwise glabrous, or very slightly hairy, keeled on under side, hollow above, with recurved apex.

Flowers rather large, rose-purple, turning bluer later. Petals obovate. Calyx half 5-cleft, with roundish-ovate teeth, not glandular, but strongly ciliated.

Rocks and debris and glacier moraines from 6000–12,000 feet, especially on primary formations. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Corbières, Pyrenees, Central and Arctic Europe, Siberia, Spitzbergen ; North America (British).

S. oppositifolia var. *Murithiana* Tissière. (Plate XXVI.)

This is the usual form of the Western and Southern Alps and Pyrenees ; in fact, Dr. Hayek of Vienna tells me all the *oppositifolia* of the Western Alps is *Murithiana.*

The long hairs on the sepals are glandular, and the plant is often looser in habit. We have seen it in many places in the Alps of Provence, Dauphiny, and Savoy, at from 6000–11,630 feet (1830–3545 metres). Professor Vaccari got it at 3800 metres on the Grivola.

Saxifraga biflora All. (Plate XXIV.)

Root very long, creeping, running out into long branches, and into long, usually simple, prostrate stems. Leaves uniform, spathulate, thickened at the apex, with one pit, ciliate, cilia of uppermost leaves ending in dark red glandular heads. Flowers usually 2 or solitary. Petals lanceolate, 3-nerved, as long as the stamens, purple-madder in colour, or sometimes rose-purple (and white in the var. *macropetala* Kern.). Calyx-lobes glandular, ciliate.

Among debris, and on moraines and primary rocks near the snow-line, and hence in wet ground in summer ; 8500–13,000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps ; local. It has been found as high as 4300 metres on the Matterhorn.

The drawing is not good, the petals being too pointed, and the flowers too open and star-shaped.

Saxifraga macropetala Kerner.

Possibly only a white and large-flowered form of the above. Petals broadly lanceolate, 5-nerved. Sepals oval, obtuse, ciliated with glandular hairs like *biflora.* Flowers sometimes lilac. Anthers orange. In white specimens gathered by the writer above Mont Cenis, at 9300 feet, the flowers were 16 mm. across. The distribution seems the same as in *biflora,* but it is much less general.

Saxifraga florulenta Moretti.

A very distinct and rare species 4 inches to a foot high, hairy-glandular, with a thick rootstock, surmounted by a large, compact rosette of leaves, which are lanceolate, mucronate, glabrous, coriaceous, with a cartilaginous margin, ciliated at the base and toothed below, shiny green, and more or less transparent. The rosettes of several

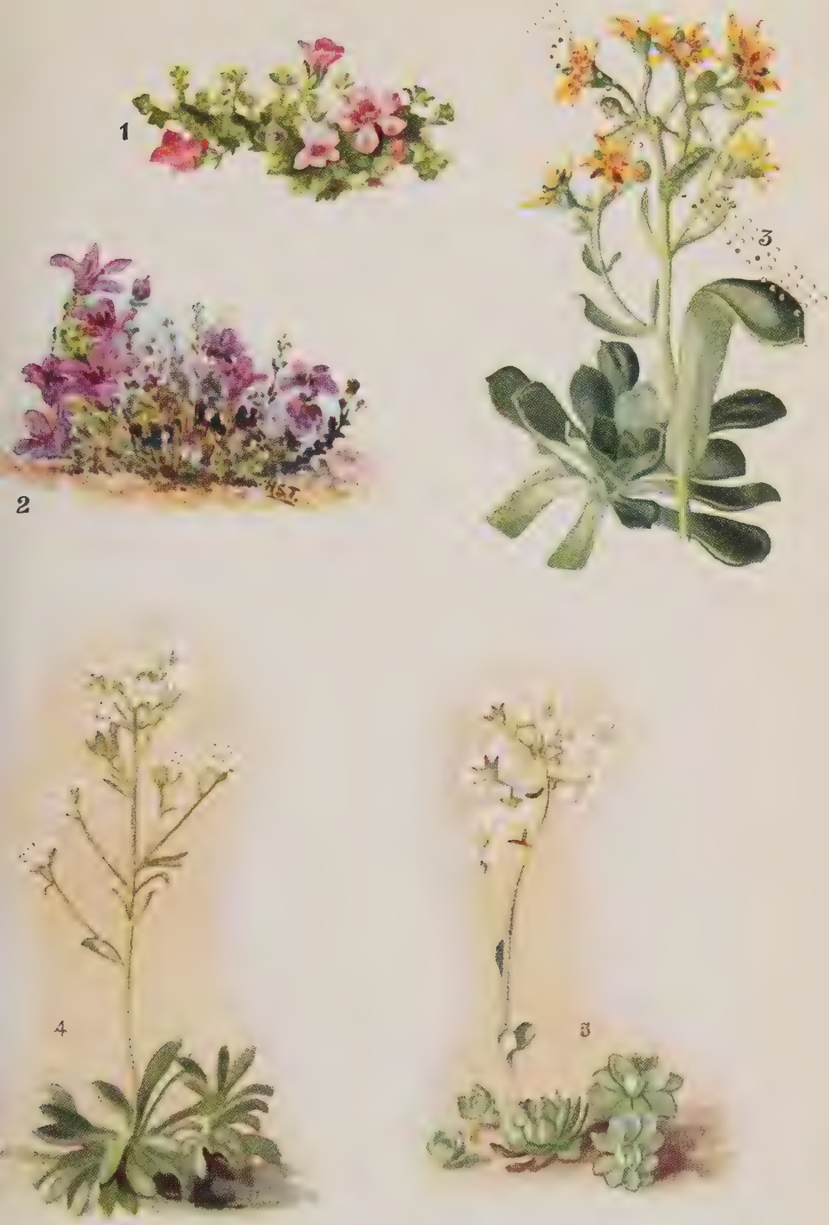

PLATE XXVI.

1. Saxifraga oppositifolia L.
2. Saxifraga Murithiana Tiss.
3. Saxifraga mutata L.
4. Saxifraga crustata Vest.
5. Saxifraga Aizoon Jacq.

seasons' growth are 5 or 6 inches across, and they throw up long, stiff panicles of rose-purple flowers and then die. The petals are oblong, sub-obtuse, attenuated at the base, with 5 veins, slightly extending beyond the sepals. Sepals lanceolate, mucronate, rather longer than the tube. 3 styles and 3 carpels. Restricted to granitic cliffs at from 7500 to 8000 feet elevation in the ranges that centre round the Argentera in the Maritime Alps, but found on both sides of the Franco-Italian frontier. July to September.

Mr. Reginald Farrer (in *Gardeners' Chronicle*, August 13, 1910) has an interesting note on this curious plant, and says he never once saw an old specimen flowering, and that specimens "which grow in crevices that fail to offer it congenial soil or scope, form deep cones of dead foliage, with a dwindling rosette at the top, and at last they give up the struggle and die flowerless." More fortunate plants flower in about 3–5 years from seed. It never fails to abandon the vertical position, and has an intense hatred of surface moisture, "whereas *S. longifolia* recurves its leaves to welcome rain." Therefore it must be grown in such a position, says Mr. Farrer, that overhead moisture does not lodge on the rosette, or even visit the rosette unduly. Moisture in the soil it requires, and tolerates almost to the extent of thriving in water runnels on a cliff. This plant is too frequently sold in the streets of Nice by peasants.

Saxifraga mutata L. (Plate XXVI.)

Stem erect, springing from a rosette of large leaves. Stem ends in a racemose cyme, covered with viscous hairs, like the bracts, flower-stalks, and calyx; ultimate branches 1–many flowered. Rosette-leaves thick, stiff, glabrous, tongue-shaped, or obovate-lanceolate, flat, obtuse, with a cartilaginous white margin, densely fringed below, inconspicuously serrate towards apex or entire, with distant, inconspicuous dots which are encrusted with lime when young. Stem-leaves smaller and passing into bracts. Petals linear-lanceolate, acute, orange-yellow. Sepals oval, obtuse, much broader than the petals.

Damp, rocky places and among debris in limestone mountains, descending into the valleys. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps. Not found in the Jura or high Swiss Alps, but occasionally in the plains.

Saxifraga Aizoon Jacq. (Plate XXVI.)

Root putting out naked runners bearing half-closed rosettes of leaves. Stem erect, 3–10 inches high, bearing a loose racemose cyme, glandular-hairy like the bracts, flower-stalks, and calyx, or calyx and lower part of stems glabrous. Branches 1–3 flowered. Rosette-leaves thick, stiff, glabrous, with cartilaginous teeth, and depressed dots near the margin; teeth sharp, covered like the dots with a white, at length deciduous, calcareous incrustation. Stem-leaves much smaller and more wedge-shaped, passing into the bracts. Petals obovate, obtuse, snow-white or sometimes cream-coloured, and often dotted with red. Very variable in size, colour, and habit, but nurserymen are too apt to give names to so-called varieties which are not always constant in their characters.

Common in rocky places in calcareous mountains up to 8500 feet. June to August.

Distribution.—Carpathians, Silesia, Bohemia, Eastern, Central, and Western Alps; Jura, Vosges, Black Forest, Corbières, Pyrenees, Caucasus, Siberia; North America.

Saxifraga Cotyledon L. (Plate XXVII.)

Stem 10–16 inches high, forming a many-flowered, loose, somewhat pyramidal panicle, branched from the base, glandular-hairy; the middle branches 5–15 flowered. Leaves of radical rosettes tongue-shaped, entire, pointed or mucronate, dotted near the serrated margin with an incrustation of lime, serratures cartilaginous at the apex. Stem-leaves smaller, passing into bracts. Petals white, often spotted with red, or more rarely with purple, wedge-shaped.

Primary rocks, especially granite, from 3500 to 6500 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, abundant on Italian side of Simplon Pass, on granite cliffs; Pyrenees, Scandinavia, Iceland.

Saxifraga altissima Kerner. (Plate XXVIII.)

Stem erect, thick, glandular-hairy, paniculate above, branches elongated, about 10-flowered. Rosette-leaves spreading, broadly tongue-shaped, apex always turned outwards, somewhat acuminate, ciliated at the base, serrated with sharp cartilaginous teeth. Stem-leaves lanceolate, bluntly serrate, uppermost linear like the bracts and ciliated with glandular hair. Calyx-teeth ovate, obtuse, cartilaginous at margin. Petals white, or greenish at the base, often with red spots, elliptical, 3-veined, twice as long as sepals. Capsule ovate, longer than the persistent, erect calyx-teeth.

Lower Alps of Upper Styria, where it is not rare. July, August.

Saxifraga longifolia Lap.

Stem 1–2 feet high, glandular-hairy, erect. Panicle branched almost from the base, leafy. Rosette-leaves dense, bluish green, spreading, linear-spathulate, pointed, convex above, thick, with entire margin, but with lateral encrusted pores simulating teeth, ciliated at the base. Flowers white, numerous, in a long, drooping panicle, with 5–15 flowers on a branch. Sepals lanceolate. Petals broadly oboval, ciliated.

High rocks throughout the chain of the Pyrenees. July, August. Best planted between two rocks which are more or less upright,

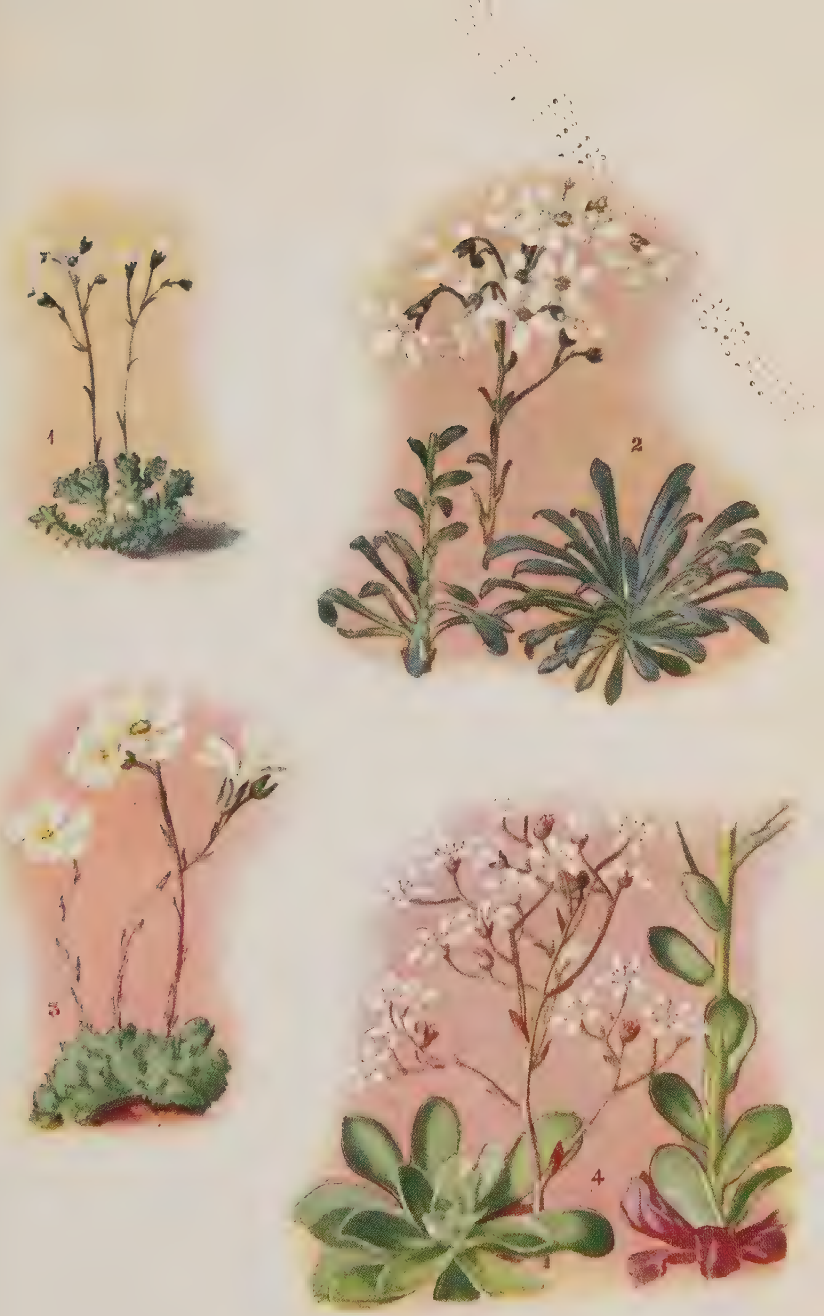

PLATE XXVII.

1. Saxifraga squarrosa Sieb.
2. Saxifraga lantoscana B. et R.
3. Saxifraga tombeanensis Boiss.
4. Saxifraga Cotyledon L.

so that water cannot collect in the large hollow rosettes. It takes 2 or 3 years to come to maturity, and after flowering and producing seed freely it dies. Self-sown young seedlings are freely produced, and can be easily transplanted.

Saxifraga lingulata Bellardi.

Stem 6–18 inches long, glabrous, rather slender and often drooping, branching from the middle or sometimes lower, with several small linear and sometimes indented leaves. Rosette-leaves linear-oblong, elongated, channelled above, rather pointed at apex, thick, entire, with an encrusted indentation at the curved-in margin. Rosettes somewhat loose and erect. Flowers milk-white, in long and rather unilateral panicles, with branches of 2–6 flowers. Calyx glabrous, but slightly rugged, with lanceolate obtuse lobes. Petals ovate, wedge-shaped. Stamens subulate.

Limestone rocks from 3000–5300 feet; very local. June, July.

Distribution.—French and Italian Maritime Alps and Ligurian Alps, with the Col di Tenda as a centre; Hautes-Alpes, Basses-Alpes, Var, Sardinia, Sicily (Etna).

It forms exquisite drooping plumes of blossom on the rocks about Tenda in company with the rather smaller *S. cochlearis*.

Saxifraga lantoscana Boiss. et Reut. (Plate XXVII.)

Stem usually shorter than in *S. lingulata*, of which it is sometimes considered a variety. Rosette-leaves linear-spathulate, broader towards the apex, with white, calcareous patches, obtuse and shorter than in *lingulata* and not channelled. Flowers milk-white, with fine lines of red dots. Inflorescence more or less unilateral. Calyx campanulate, with lanceolate, obtuse teeth.

Limestone rocks on northerly and westerly exposures in the district round St. Martin Lantosque (St. Martin Vésubie) in the Maritime Alps, and at Mont de la Chen in the Department of the Var (*fide* Burnat *ex* 'Albert et Jahandiez');[1] and possibly in Liguria, for Mr. Bicknell says, 'A form (of *S. lingulata*) with shorter and more obtuse leaves which I have seen in rather lower situations (in Liguria) seems to be *S. lantoscana* Boiss. et Reut.'[2]

M. Burnat, in his excellent *Flore des Alpes Maritimes*, distinguishes as a separate plant *S. Bellardii*, which occurs nearer the Col di Tenda, with *lingulata* and *cochlearis*; but there seems to be some confusion about *S. lantoscana* and its forms, and the matter has recently been discussed at great length in the columns of the *Gardeners' Chronicle*,[3] by Mr. Farrer and others.

Saxifraga cochlearis Reichb.

Stem 4–12 inches long, glandular except at the summit, slender, reddish brown, branching above the middle into a rather dense, usually short and sometimes glandular panicle, with usually 3 flowers on each branch. The panicle in exceptionally large specimens from Tenda which the writer measured was 7 inches in length. Rosette-leaves quite short, broadly linear at the base and suddenly dilated into a suborbicular limb or rounded, spoon-shaped apex, coriaceous and rugged in texture, encrusted at the margins with lime. Stem-leaves narrowly oboval, very small and slightly glandular. Flowers milk-white. Petals obovate, wedge-shaped. Calyx glandular with obtuse lobes.

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[1] *Cat. des Pl. Vasc. dans le Dept. du Var* (1908), p. 189.

[2] Bicknell, *Fl. of Bordighera and San Remo* (1896), p. 110.

[3] *Gard. Chron.*, Oct.–Dec., 1910.

Subalpine limestone rocks in the French and Italian Maritime Alps, particularly about the Tenda road, and also abundantly on some of the adjoining mountains of Liguria further east, where it descends to about 1300 feet at Buggio in the Nervia valley and ascends to 5500 feet. Endemic in this district. June, July.

Saxifraga crustata Vest. (Plate XXVI.)

Stem 2–4 inches high, erect, racemose above, glandular-hairy, branches naked, few-flowered at the head of the stems. Rosette-leaves broadly linear, obtuse, entire, the cartilaginous margin strongly encrusted. Petals white, obtuse, obovate or wedge-shaped.

High calcareous Alps, but descending below the Alpine region as, e.g., in the deep and narrow valley at Weitenstein ; 3000–7200 feet. June, August.

Distribution.—Carpathians, Tyrol to Carinthia.

Saxifraga diapensoides Bell.

A small grey-green species, 2–3 inches high, forming dense cylindrical tufts of imbricate leaves ; stem glandular, viscid. Barren shoot leaves, trigonous, imbricate, straight, linear-lanceolate, upper part sometimes broader than the base, with a strong limy incrustation. Stem-leaves alternate, linear, pubescent. Petals obovate-cuneate, with several veins, milk-white, rather long and erect. Flowers in dense corymbs of 2–6. Calyx glandular-pubescent, with short, erect sepals.

On Magnesian limestone from 5800 to 7800 feet, in the Val de Bagnes, etc. ; rare. July, August.

Distribution.—Eastern, Central, and Western Alps. Very rare in Switzerland, and more frequent on some of the mountain summits in the Maritime Alps.

Saxifraga squarrosa Sieb. (Plate XXVII.)

Stem 1–3 inches high, 2–6 flowered, with a few glandular hairs. Leaves of shoots imbricate, erect, with recurved apex, linear-lanceolate, convex on under side, obtusely keeled, with seven dots on the upper side, fringed at the base and encrusted with lime when young. Petals roundish obovate, with 5 straight nerves, white or yellowish white.

Calcareous and dolomitic Alps, 4300–8800 feet. June to August.

Distribution.—Carpathians, Tyrol to Carinthia.

Saxifraga tombeanensis Boiss. (Plate XXVII.)

Runners numerous, densely leafy, columnar, erect or ascending. Stems erect, about 3 inches high, cymosely branched and 1–3 flowered, densely covered with fine glandular hairs. Leaves of runners imbricate, erect, or with apex curved inwards, ovate-lanceolate, ending in a soft spine, trigonous, slightly cartilaginous, margin covered with delicate glandular hairs. Calyx-teeth elongated, longer than calyx-tube. Petals broadly ovate, white, thin, many-nerved, 3 to 4 times as long as calyx-teeth.

Distribution.—Southern Tyrol, on the Tombea below Storo, Val Vestino, Monte Baldo; Lombardy; very local. April, May.

Saxifraga cæsia L. (Plate XXVIII.)

A small grey species, a few inches high, with cylindrical tufts of densely imbricate leaves. Stem ascending from a hemispherical rosette of leaves, and bearing a 1–6 flowered corymbose cyme. Stem-leaves and calyx glabrous and glaucous, or with a few glandular hairs. Lower leaves with recurved margins, hard, thick, linear-lanceolate, nearly triquetrous, acute, entire, dotted with pores at the margin, fringed at the base, when young encrusted. Stem-leaves smaller, linear. Petals obovate, obtuse, white; twice as long as the sepals.

Limestone rocks and screes from the snow-line downwards, and sometimes descending into valleys with the debris of streams. June to August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Apennines. Plentiful near the top of the Gemmi Pass.

Saxifraga valdensis DC.

A taller and more robust species than the last, glaucous, hairy-glandular, with numerous tufts of narrow, imbricate, linear-spathulate leaves, which are also obtuse, and triquetrous at the summit, entire, with pores above and a cartilaginous margin. Reginald Farrer, in *Gardeners' Chronicle*, October 8th, 1910, says: 'The leaves are so tightly pressed back upon each other that the cushions of *S. valdensis* present no point to the hand laid upon them,' though they make 'the densest, hardest, and most impenetrable dome' that writer knows of among the Silver Saxifrages. Flowers white, 5–10 in a tight corymb. Petals obovalrounded, three times as long as the sepals, and with 3–5 nerves. Peduncles and calyx hairy-glandular.

Cliffs and rocks of disintegrating granite, exposed to the hot sun, at about 7500 feet in the Cottian Alps, i.e. in Hautes-Alpes, Basses-Alpes, and Piedmont. July, August.

Mr. Farrer remarks that a form of *S. cochlearis* invariably masquerades under the name of *valdensis*, and points out in the note referred to how the species differ, but we would remark that *valdensis* is nearer *cæsia* in habit than any of the forms of *cochlearis*.

In cultivation it should be remembered that this species has a preference for primary formations, which is so rare among Silver Saxifrages.

Saxifraga Burseriana L. (Plate XXVIII.)

Stems erect; 1 or rarely 2-flowered; covered, like the calyx, with red glandular hairs. Root putting out a rather crowded tuft of runners with imbricate leaves. Runners 1–2 inches high, prostrate, bearing a dense rosette of leaves, which are greyish green, stiff, patent, glabrous, acuminate, almost trigonous, ending in a stiff spine, with depressed dots along the sharply cartilaginous margin, shortly ciliate at the base, with a calcareous incrustation when young. Stem-leaves much smaller. Flowers large, white, with pinkish veins. Petals roundish, flat, crenulate.

Calcareous and dolomitic Alps and lower Alps up to 7800 feet. March to June

Distribution.—Eastern Alps. Near Botzen, etc.

This early and beautiful species should be planted in half-shade, but never under trees or dripping rocks, in coarse loam and grit, and top-dressed in autumn with gritty loam. In summer it must not be allowed to get too dry, and in winter it will damp off if exposed to excessive moisture or any drip. This applies also to many kinds of Saxifrage, for they get moisture from the melting snows in summer, and are snow-bound in winter in their native haunts.

Saxifraga Vandelli Sternb. (Plate XXVIII.)

Stem 3–9 flowered, densely covered with short, reddish purple, glandular hairs. Leaves of the runners very crowded, imbricate, tufted, erect, lanceolate, trigonous, ending in a sharp spine, with a cartilaginous streak at the margin, which is fringed at the base, and has 5 slightly encrusted pits on the upper side. Stem-leaves 6–7 mm. long, lanceolate, mucronate. Petals elliptical, three times as long as calyx, milk-white or yellowish white, with straight nerves.

Calcareous rocks on the Alps and lower Alps; very local. July, August.

Distribution.—Rhætian Alps, Tyrol, Ortler, Styria. Doubtful for Switzerland, but it occurs in Livigno, just outside of the Canton of the Grisons.

Saxifraga aizoides L. *S. autumnalis* L. is the earlier name, Linnæus having given two names to the same plant. (Plate XXV.)

Stem erect or ascending, leafy, bearing a numerous-flowered, racemose cyme, but often only 2–3 flowered, hairy, especially at the

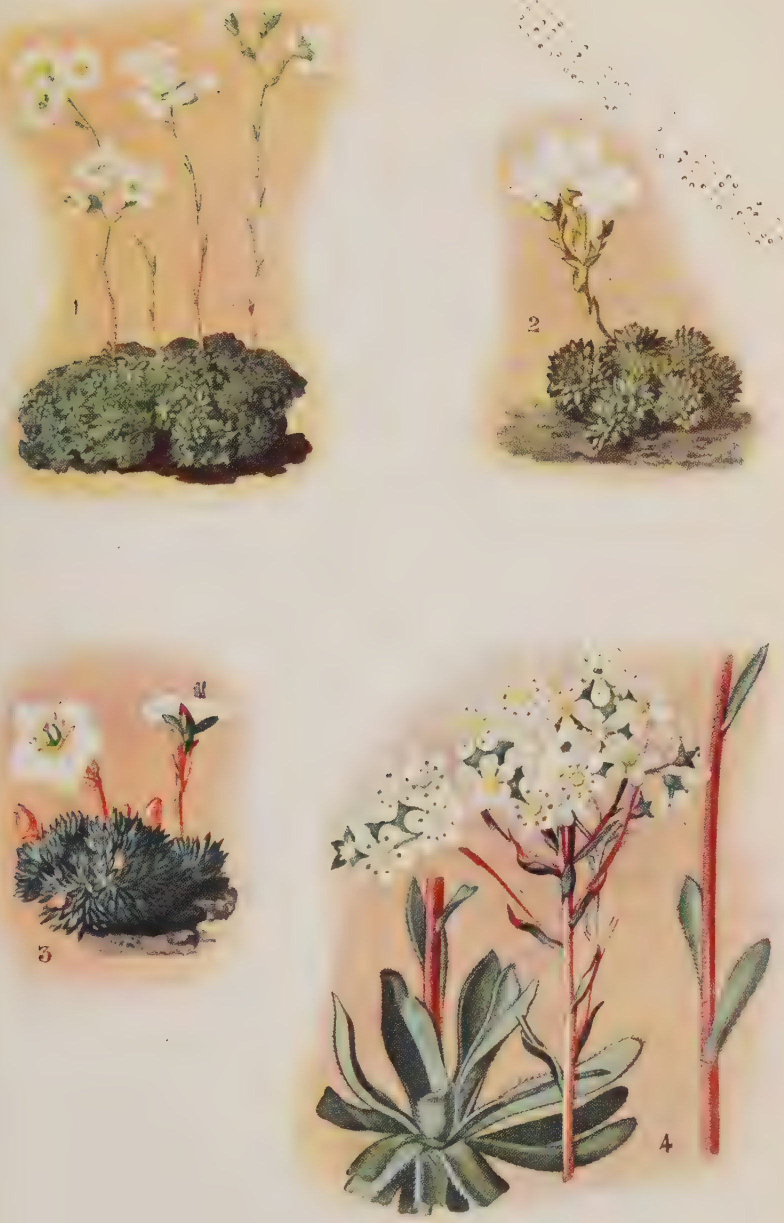

PLATE XXVIII.

1. Saxifraga cæsia L.
2. Saxifraga Vandelli Sternb.
3. Saxifraga Burseriana L.
4 Saxifraga altissima Kerner.

summit. The root sends out numerous tufts of leafy shoots. Leaves glabrous, grass-green, nerveless, entire, linear or linear-lanceolate, more or less ciliate, apiculate, alternate, crowded at the apex of the shoots. Calyx hairy at base. Petals linear-lanceolate, as broad as the calyx-teeth, yellow or orange, or indeed any shade from pale yellow to deep orange-red. Stamens orange-yellow.

Common in damp places by streams, etc., in the Alps; 3000–8000 feet, and occasionally seen at even 10,000 feet. June to September.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Southern Jura, Pyrenees, Apennines, Central and Arctic Europe, Ural Mountains, North America (British).

S. atrorubens Bertol. is merely a variety with deep red flowers and leaves with stiff cilia at the margin. It is recorded from Tyrol, and we have seen it in the sand of a mountain torrent near Engelberg in Switzerland and occasionally in Savoy. Probably it is by no means rare.

Saxifraga tenella Wulf.

Shoots prostrate or erect. Stem with buds in the leaf axils, ascending, glabrous, branched. Leaves linear-subulate, cuspidate (or awned), stiffly ciliate or glabrous, with one dot on upper side near the apex. Calyx-teeth cuspidate. Flowers whitish, small. A slender, green plant, 4 inches high.

Rocky places from 3300–6000 feet; local. July, August.

Distribution.—Styria and Julian Alps.

Muscaria Group

Saxifraga androsacea L. (Plate XXV.)

Shoots forming loose rosettes of leaves, more or less congregated into a cushion. Stem erect, 1–3 inches high, hairy, 1–2 flowered, or in a loose, 3–5 flowered cyme, leafless or 1-leaved, besides the leaf-like bracts. Leaves elongated wedge-shaped or obovate, obtuse, entire or with 2–3 coarse teeth near the apex. Calyx-teeth erect. Petals milk-white, obovate-lanceolate, obtuse, and sometimes emarginate, forming a bell-shaped corolla.

Damp Alpine pastures up to 9800 feet. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Corbières, Pyrenees, Siberia, Arctic regions.

Saxifraga Seguieri Spreng. (Plate XXV.)

A very small, slender species 1 inch high, with spathulate leaves of rosettes and barren shoots. Stem very slender, bearing 1 or 2 small lanceolate leaves or none at all, downy like the whole plant. Root-leaves obtuse, entire or with 1–3 teeth at the apex, ciliate, glandular, and many-nerved, especially visible when dried. Flowers small, greenish yellow, on very short pedicels. Petals narrow, linear-oblong, slightly longer than the sepals.

Rocks and damp Alpine pastures; local; 8000–10,500 feet. July, August.

Distribution.—Switzerland, Savoy, Tyrol, Piedmont, but never in large quantity, and apparently little known except in Switzerland. On the Piz Languard, near Pontresina it is frequent up to 9000 feet.

Saxifraga aphylla Stern. (*S. stenopetala* Gaudin).

Somewhat resembles the last in habit, and equally or more fragile. The petals are yellowish white, a little longer, but narrower than the sepals. Anthers bright yellow. Stems usually 1-flowered, and without leaves above. Leaves glandular-ciliate, usually 3-lobed at the apex, and rarely entire. Sepals obtuse.

High Alpine pastures and shady rocks, 7000–9000 feet, chiefly confined to Eastern Switzerland. July. Engadine, Albula Pass, Rothstock in Bernese Oberland, etc.; also in some of the Austrian Alps.

Saxifraga planifolia Lapeyr.

Is now considered a dwarf variety of *S. muscoides* All. Indeed, Schinz and Keller and Gremli consider it the same plant. The white petals are twice as long as the calyx-lobes. Best known by the whitish grey tips of the otherwise brown dead leaves.

Very high Alpine rocks and pastures up to 14,000 feet; very local. July, August. Recorded from near the top of the Matterhorn at 4200 metres.

Distribution.—Central and Western Alps, and occasionally in Austria, Eastern Pyrenees.

Saxifraga moschata Wulf. (*S. varians* Sieb.). (Plate XXV.)

A most variable and perplexing plant, whose synonymy appears little understood, and has sometimes been confused with *S. muscoides* All. It is one of the commonest and most variable of high Alpine Saxifrages. A small, usually hairy-glandular species, 1–4 inches high, forming dense and often large tufts. Stem slender, with a few small leaves, and branched at the top into a loose cyme with 2–6 flowers, though sometimes single-flowered. Leaves more or less glabrous, linear, and entire, or more frequently wedge-shaped and 2–5 cleft, nerves showing when dry only. Flowers pale or bright yellow, or rarely purple-brown, with dull yellow anthers, star-shaped. Petals rounded and slightly longer than the sepals.

Rocks, belts of turf and mould and Alpine pastures from 6000–14,000 feet. June to August.

Distribution.—Eastern, Central, and Western Alps; Southern Jura, Carpathians, Pyrenees; Central and Southern Europe, Caucasus, Altai.

Saxifraga exarata Vill.

A very viscid, glandular, cæspitose species, and variable like the last. Stems slender, with 1–3 small entire or trifid leaves, 4–10 flowered. Lower leaves imbricate, in dense tufts, bright green, viscous, strongly nerved, linear-oblong or oblong wedge-shaped, entire or more frequently 2–3 fid at the apex. The older leaves are reddish brown. Petals yellowish white, small, more or less oboval, once or twice as long as the sepals, which are oblong-lanceolate and sub-obtuse.

Damp rocks and Alpine pastures, 5000–10,800 feet. June to August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Caucasus, Arctic regions.

This species is found as far south as the mountains of the Var, the highest ridge, called La Chens, being 1713 metres. There also appear *S. Aizoon*, *S. lingulata*, *S. hypnoides*, and *S. cuneifolia*.

Saxifraga obscura G. and G., *S. nervosa* Lapeyr., *S. Iratiana* Schultz, *S. pentadactylis* Lapeyr., and the handsome *S. geranioides* L. are Pyrenean species belonging to this section, which space precludes us from describing here. *S. camposii* B. and R., better known in cultivation as *S. Wallaci*, is a Spanish species. Its reddish green leaves are fan-shaped on a long, narrow petiole, the apex divided into 3 lobes, which are again subdivided. The flowers are white and very large, with veined petals and lanceolate, apiculate sepals, with a few glandular hairs.

Saxifraga pedemontana All.

A viscous, glandular plant, about 6 inches high, with 3–9 large white, tubular flowers. Stem branched, and forming a loose corymb. Leaves cuneate or fan-shaped, 3–5 cleft, with each lobe 3-cleft again; upper leaves simple. Petals 3-nerved, linear-lanceolate, at least twice as long as the very acute sepals, and suddenly contracted into a claw.

Granitic rocks in shady and rather moist places, from 5000–7800 feet; very rare. July.

Distribution.—Piedmont and Liguria; Maritime Alps; Transylvania, and rarely in Switzerland in the Binn and Monte Rosa districts. In habit and size of flowers, but not in the leaves, this resembles the Pyrenean *S. geranioides*.

Saxifraga hypnoides L.

Leaves of shoots entire and 3-cleft, narrow, linear, and pointed, those of rosettes 3–5 cleft, glabrous or more or less ciliate. Stems 3–6 inches long, with very few linear leaves, and from 1–6 rather large white flowers. Calyx segments pointed and not one-third as long as the petals.

Rather moist, rocky places in the limestone mountains of Western Europe, descending sometimes to low, hilly districts. Abundant in Scotland, Wales, Ireland, and Northern England, but very local in the south, as e.g. at Cheddar Cliffs. May to July.

Saxifraga cæspitosa L.

Much stouter than the last and covered with short, glandular hairs, and never with the procumbent barren shoot of that species; the leaves are broader, more obtuse, and more frequently lobed (3–5 segments), and the calyx-lobes are obtuse. The leaves form very dense green tufts, closely packed together. Flowering stems 2–3 inches high, usually covered with short, glandular, downy hair, and bearing 1 or 2 white flowers, or occasionally more, in a loose terminal cluster. Flowers smaller than in *hypnoides*, being about twice as long as the obtuse sepals.

Rocks and stony mountains in Northern and Arctic Europe, and in very small quantity on one or two high Scotch summits. May to July.

Saxifraga sponhemica Gmel.

A very protean species, with the habit and lower leaves of *S. hypnoides*, and like it, in sending out long sterile runners. Stem-leaves often trifid; root-leaves with a narrow petiole, flat, with 3–5 linear-lanceolate divisions, mucronate. Flowers 2–9 in a loose panicle. Sepals lanceolate. Petals obovate, with 3 greenish veins, twice as long as sepals or longer.

Rocky hills in North-western and Central Europe, and possibly in Britain, as on Snowdon. June to August.

Saxifraga decipiens Ehrh.

Perhaps only a variety of the last. It is recorded from Southern Europe, and also from Co. Kerry at about 2500 feet, and from Mayo at from 200 to 1300 feet above the sea. The numerous beautiful cultivated varieties of mossy Saxifrages with pink or deep red flowers, such as *S. Rhei* (' Guildford Seedling ') and *hybrida grandiflora* or *Bathoniensis* are supposed to have originated in *S. decipiens*, though *S. Rhei* Schott grows naturally wild in Transylvania.

Saxifraga Sternbergii Willd. (1809).

This is sometimes considered a variety of *S. sponhemica*, and is synonymous with *S. hirta* Donn (1809) which was first found near the summit of Macgillicuddy's Reeks in 1805. It still grows there sparingly, at about 2500 feet, in rather moist, stony places, and was flowering in July, 1910. In Co. Clare it descends almost to sea level. It is also recorded from Bohemia.

The dead leaves form a column about an inch high, whence spring the tufts of new leaves, which are linear, ciliate, and deeply 3-cleft at the apex, with a few glandular hairs. The stem, about 2 inches high, is furnished with 1 or 2 simple or trifid leaves. Petals ovate, and 3 times the length of the broadly lanceolate sepals.

It is impossible in a book of this character to give but the barest outlines of the culture of many of the plants. Readers are referred to such books on horticulture as those by Messrs. William Robinson, Reginald Farrer, Meredith, and W. A. Clark. Saxifrages are perhaps the easiest to grow of all Alpine plants, and several besides the London Pride section, which is not strictly Alpine, thrive under ordinary conditions in an English garden. We have already given a few instructions about several species, and in regard to others the gardener can be guided as to whether to plant in limestone, sand, or grit, by taking note of the natural habitats given for each plant. Common sense again will tell him not to plant such species as *S. aizoides* or *S. Hirculus* in a very dry place, nor the great majority in wet places, or under trees where water drips, and this applies especially to the 'encrusted' section. Most of these will be benefited by top-dressing in the autumn with gritty loam. Many should be wedged tightly between stones in a sunny position, and in regard to small kinds, such as *cæsia* and *diapensioides* care should be taken to see that they do not get washed out of their place in winter. The small rosettes of encrusted Saxifrages may be removed and transplanted at any time, and it is customary to remove such rosettes, so as to concentrate the energy of the plant on the parent flowering rosette. The young seedlings will do well in ordinary pots filled with sandy soil. The *oppositifolia* group die away in the course of two or three years, and should be taken up and pulled to pieces as soon as decay begins in the centre of a clump, then planted in separate pieces in fresh soil, or in another part of the rockery, and grit and leaf-mould may be worked into the shoots as a top-dressing. It is better done soon after flowering. *S. rotundifolia* will do well in the shade of trees. Grit of any kind is so beneficial to many Saxifrages, because it checks the evaporation of moisture in summer, and prevents damp from stagnating round the collar of plants in winter. Stones in the soil remain cool and moist, even in the summer, and that is why roots are often found in a sort of network over the surface of a stone. It is therefore better to mix a quantity of stone chips with ordinary loam when making a rock garden. It all tends to keep the soil open and porous, instead of being sodden and water-logged. The air also can penetrate further, and frost can exercise its pulverising influence on a rough, gritty soil better than on a dense, compact one.

Parnassia palustris L. (Grass of Parnassus.)

Stem 6–12 inches high, with a single perfoliate leaf below the middle, with a solitary terminal flower. Root-leaves rather long-stalked, broadly heart-shaped, acuminate, entire, glabrous. Flowers white, large. Petals obovate, beautifully veined, spreading, twice the length of the sepals, which are ovate and spreading. Imperfect stamens at base of each petal, with a tuft of 10–12 white filaments, each bearing a small, yellow globular gland. Capsule globular, 3–4 valved.

Damp heaths and bogs and wet places from sea level in England to 8000 feet in the Alps, but mostly subalpine. July to September.

Distribution.—Central and Northern Europe; Western Asia, Thibet, Japan, North America.

This very beautiful and hardy plant might be much more cultivated in bogs, with heaths, etc., below the rockery. It has disappeared from several places in the south of England, but can still be seen within seven miles of the centre of Birmingham, and is very common in Switzerland.

UMBELLIFERÆ

Herbs with alternate leaves, often much cut and divided. Flowers small, regular, in terminal or lateral umbels (simple or compound). At the base of the umbel are often a few bracts, constituting the involucre. Calyx-lobes 5, small, or usually entirely wanting. Petals 5. Stamens 5. Ovary 2-celled, 2-seeded. Styles 2. Fruit separating when ripe into two 1-seeded, indehiscent carpels. Leaf-stalk usually sheathing.

A large family, more or less represented nearly all over the globe, particularly numerous in Mediterranean districts and Western Asia.

Hacquetia Epipactis DC.

Stem simple, leafless, about 4 inches high, bearing a single simple umbel with short rays and a large involucre, 3 times the size of the umbel. Flowers small, greenish yellow. Calyx-limbs toothed. Leaves all radical, 3–5 lobed, glabrous.

Bushy places up to 5000 feet in the Eastern Alps, from Carinthia to Carniola. April, May.

Astrantia L.

Herbs with mostly radical, palmately divided leaves. Umbels simple or compound; involucre large, membranous, and often purplish in colour. Flowers polygamous. Petals notched, with a long inflexed point. Calyx-limb with 5 long teeth. Carpels with 5 inflated crimped ribs.

A small genus extending over Central and Southern Europe to Western Asia.

Astrantia major L. (Plate XXIX.)

Stem 1–2 feet high, or sometimes higher, erect, furrowed, glabrous like the entire plant, simple, or more usually divided into 2 or 3 branches. Leaves palmately 5-fid, lobes lanceolate or obovate-lanceolate, acute, undivided or 2–3 cleft, unequally doubly serrate; radical and lower stem-leaves long-stalked, upper ones mostly sessile. Secondary umbels many-rayed, collected into 1, 2, or 3 irregular umbellate cymes. Bracts of general involucre net-veined,

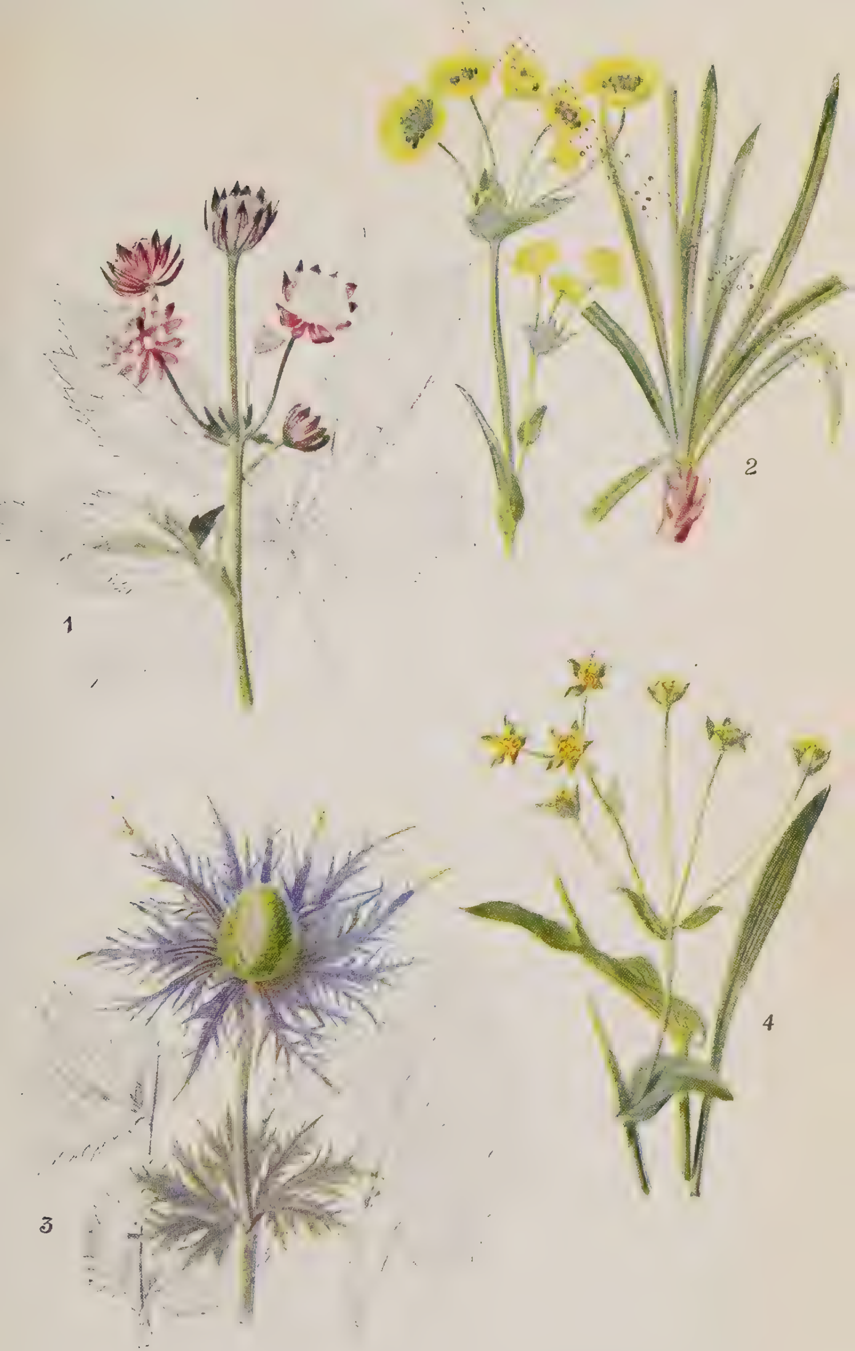

PLATE XXIX.

1. Astrantia major L.
2. Bupleurum stellatum L.
3. Eryngium alpinum L.
4. Bupleurum ranunculoides L.

[illegible]

coloured white and red like the petals, 2–3 cleft or toothed, upper ones usually entire. Bracts of partial involucre lanceolate, entire, coloured, radiating, rather longer than the secondary umbel. Mountain pastures and damp, shady, woody places in the Alps, descending to the plains. June to September.

Distribution.—Carpathians, Sudetic Mountains, Eastern, Central, and Western Alps, Jura, Black Forest, Corbières, Pyrenees. Sometimes naturalised, but not native in Britain.

This very handsome plant is useful for the more shady portions of the rock garden with other big plants such as *Achillea macrophylla* and *Gentiana asclepiadea.* When well coloured it is extremely beautiful, and its stiff flowering spikes last a long time in water when cut, and are therefore useful for bouquets.

Astrantia carniolica Wulf.

Stem 12–20 inches high, smooth. Root-leaves stalked, deeply and palmately 5-cleft; divisions elliptical ovate, acute, sharply serrated; stem-leaves with a short sheathing petiole, trifoliate. Involucral bracts reddish, with or without lateral nerves, longer than the umbels. Flowers white. Calyx-teeth lanceolate, acuminate. Pedicel of sterile flowers very rough and warty. Central papillæ of the ridges obtuse.

Thickets, woods, and pastures on the Alps and lower Alps. July, August.

Distribution.—Eastern Alps of Carinthia and Styria; local.

Astrantia minor L. (Plate XXX.)

Stem 6–10 inches high, weak. All the leaves digitate, with 7–9 lanceolate, cut and serrated segments. Calyx-teeth ovate-lanceolate, acuminate. Flowers small, reddish white. Involucral bracts white with green apex.

Pastures and damp rocks in the granitic Alps, 4000–8000 feet.

Distribution.—Tyrol, Switzerland, Western Alps, Pyrenees, Spain.

This plant will probably not thrive on a limestone or chalky soil, for it is a great hater of lime. It should have plenty of water in summer and shade. However, it is a poor species compared with *major.*

Eryngium alpinum L. (Plate XXIX.)

The Alpine "Sea-holly" or Reine des Alpes. A thistle-like plant, with erect, striated stem 1–2½ feet high, bluish, like the upper involucral bracts. Leaves ciliate-spiny; root-leaves entire, cordate-lanceolate, dark green; stem-leaves amplexicaul, deeply incised, and the uppermost almost palmate. Involucre blue, multidigitate, somewhat longer than the cylindrical umbel, and with stiff, bristly teeth.

Meadows and pastures in the limestone Alps, 5000–6000 feet. July, August.

Distribution.—Carinthia, Carniola, Bosnia, Montenegro, Switzerland, Jura, and Western Alps; local.

Can be grown in ordinary well-drained garden mould.

BUPLEURUM L.

Leaves entire, simple, usually glabrous. General and partial involucres various; in Alpine species the partial involucre is large. Flowers small, yellow or green. Petals hooded with an inflexed point. Styles short, reflexed.

Bupleurum stellatum L. (Plate XXIX.)

Stem erect, simple, with only one linear-lanceolate leaf embracing the stem, or leafless. Root-leaves broadly linear, with 1 longitudinal nerve, and reticulate lateral nerves. Involucre of 1–3 bracts; partial involucre of 9–10 yellow bracts, connate to their middle, the apices only free. Principal ridges of fruit with membranous wings.

Dry, rocky places in the Alps, 5000–7500 feet. July, August.

Distribution.—Tyrol, Carinthia, Switzerland, Western Alps.

Bupleurum longifolium L.

Stem erect, simple or somewhat branched above, round, finely furrowed, glabrous like the whole plant. Leaves with longitudinal veins, acute, elliptical, and running down into a long leaf-stalk, the upper leaves lanceolate or ovate, acute, sessile, with a cordate amplexicaul base. Umbel 5–6 branched, general involucre 3–5 leaved, partial involucre 5–7 leaved. Bracts ovate or elliptical, shortly apiculate. Ridges of the fruit narrow, furrows smooth, in 3 courses.

Rocks and stony places in the Alps and sub-Alps up to 5000 feet. July.

Distribution.—Eastern, Central, and Western Alps.

Bupleurum ranunculoides L. (Plate XXIX.)

An extremely variable species, subdivided into several sub-species and varieties, and varying in height from 2 inches to a foot. Stem leafy and more or less branched. Radical leaves ovate or cordate. Other leaves linear or linear-lanceolate. Partial involucre is very variable in size.

The commonest species, and growing in hot subalpine valleys, such as the Rhône Valley, up to rocky pastures and Cols at an elevation of over 8500 feet.

Distribution.—Eastern, Central, and Western Alps; Pyrenees; Central Europe from Spain to Bosnia.

Athamanta cretensis L. (Plate XXX.)

Stem erect or ascending, terete, furrowed, simple or branched, either downy or glabrous, there being two distinct forms of this plant which Dr. Briquet has distinguished. Leaves tri- to multipinnate, lobes linear or linear-lanceolate. Umbels 1–5 rayed. General involucre few-leaved, deciduous, or wanting; partial involucre many-leaved. Bracts lanceolate, apiculate, membranous, with an herbaceous centre. Flowers white, often tinged with red. Cremocarp densely covered with short, spreading hairs. Variable in size and pubescence, according to situation.

Rocky and stony places in limestone mountains up to 8500 feet. June to August.

Distribution.—Carpathians; Jura, Eastern, Central, and Western Alps. Extends from Southern Germany to the Var, and from Bosnia to Spain.

Meum athamanticum Jacq.

Stem erect, terete, furrowed, glabrous like the entire plant, few-leaved, usually branched. Leaves bi- to ter-pinnate; lobes divided many times into capillary, almost whorled segments. General involucre many-leaved, often unilateral. Bracts linear-subulate, about as long as the secondary umbels. Flowers whitish, small. A good forage plant.

Alpine and subalpine meadows; 3000–6600 feet. June to August.

Distribution.—Western and Central Europe, as far north as Norway, occasionally in Britain.

Meum Mutellina Gaertn. (*Ligusticum Mutellina* Crantz). (Plate XXX.)

Stem 12–18 inches high, erect, round, furrowed, glabrous like the whole plant, sometimes branching above into 2 or 3 branches, and in that case 1–2 leaved. Leaves bi- or ter-pinnate, segments pinnatifid, with linear-lanceolate teeth. General involucre of a single bract or wanting; partial involucre of 3 or more lanceolate membranous bracts, as long as the secondary umbel, or longer, often divided into two halves. Flowers pinkish white.

Alpine and subalpine pastures up to 7600 feet; common. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Vosges, Black Forest, etc.

Gaya simplex Gaud. (*Ligusticum simplex* All.).

Stem erect, 3–6 inches high, furrowed, thick, glabrous like the whole plant, simple, leafless, or with 1 or 2 leaves, with a single umbel. Leaves somewhat fleshy, usually ter-pinnate, linear, shortly acuminate, segments pinnatifid, with linear teeth. Involucres composed of many linear-lanceolate bracts, undivided, or 2–3 cleft at apex. Flowers small, white or reddish.

High Alpine pastures, in damp places up to 9000 feet. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps.

Peucedanum Ostruthium (L.) Koch.

A robust plant 1 to 2 feet high, glabrous, but hairy in upper part. Leaves thick, often hairy underneath, ternate or bi-ternate, light green; leaflets ovate, unequally dentate. General involucre 0; partial involucre many-leaved. Flowers white or pink. Fruit ovoid, with broad wings; primary ridges filiform.

Damp, stony places in the Alps and sub-Alps; meadows and sides of mountain streams reaching to 9000 feet in the Alps of Dauphiny and Savoy. June to August.

Distribution.—Central Europe from the Pyrenees and Spain to Russia, and as far north as Iceland.

CAPRIFOLIACEÆ

Trees, shrubs, or herbs with opposite leaves and no stipules. Flowers usually in terminal heads, corymbs, or panicles, more rarely axillary. Corolla regular or irregular, 5-lobed. Stamens 4–10. Ovary 1–6 celled. Fruit a berry or drupe. Leaves simple or pinnate.

About 230 species, more or less spread over the globe.

LONICERA L.

Lonicera alpigena L.

An erect shrub, 2–5 feet high. Leaves opposite, stalked, elliptical, ovate or lanceolate, acuminate, nearly glabrous, entire, paler on the under side. Flower-stalk solitary, axillary, glabrous, 2-flowered, usually about an inch long and pendent. Flowers bright red, 2-lipped, saccate above. Ovaries 2, connate nearly to the calyx-limb, finally coalescing into an ovate-orbicular red double berry.

Calcareous Alps and lower Alps up to 5700 feet. May, June.

Distribution.—Eastern, Central, and Western Alps, Jura, Cevennes, Corbières, Pyrenees.

Lonicera cœrulea L.

A shrub barely a yard high, with oval, obtuse leaves, very shortly petioled. Flower-stalk much shorter than the yellowish white petals. Berries blue-black, globular.

Bushy places and damp Alpine pastures up to 6500 feet, especially on limestone. Once, above Saas Fee in Switzerland this was growing as high as 8000 feet. May, June.

Distribution.—Central and Northern Europe (Alps and Pyrenees), Caucasus, Siberia, North America.

Linnæa borealis L. (Plate XXX.)

Root branched, creeping, throwing up barren shoots and flowering stems 3 or 4 inches high, naked, glandular, and bearing on slender pedicels 2 or rarely 3 pendent, white, campanulate flowers with pink veins. Flowers sweet-scented. Leaves opposite, shortly stalked, ovate-orbicular, slightly crenate, evergreen, rather coriaceous. Capsule berry-like, glandular-hairy, inferior.

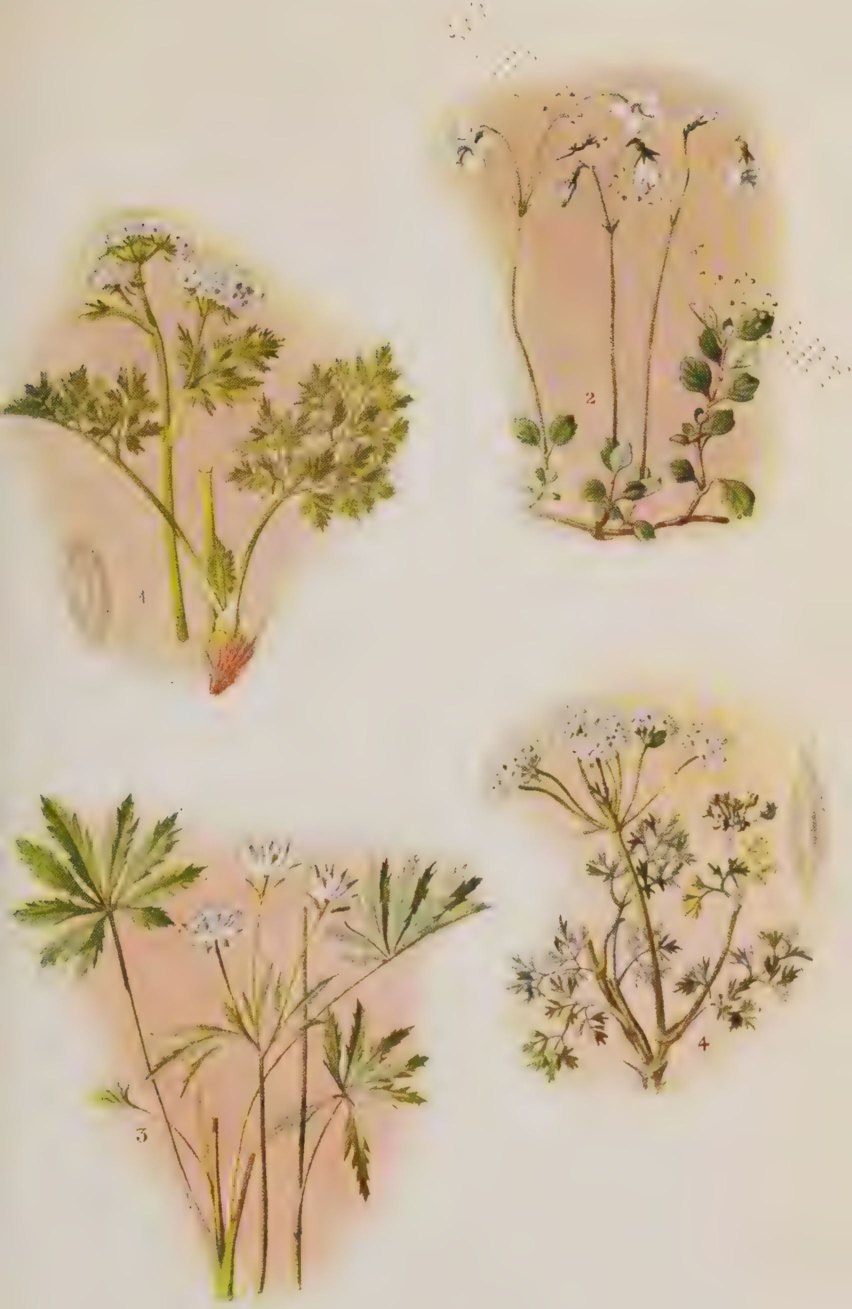

PLATE XXX.

1. Meum Mutellina Gærtn.
2. Linnæa borealis L.
3. Astrantia minor L.
4. Athamanta cretensis L.

Creeping in moss in damp, shady places in the Alps and in mountain woods up to 6600 feet ; very local. June to August.

Distribution.—Carpathians, Riesengebirge, Harz Mountains, North German Plain, Haute-Savoie near the Swiss frontier (rare), Eastern Switzerland (Engadine, etc.), Norway, Scotland, Northern Asia and North America.

Linnæa likes a shady place in moist peat, loam, and sand, or it can be planted on the north side of a rockery, care being taken to see that it does not get crowded out. A top-dressing of sand and leaf-mould occasionally will benefit the young shoots, and allow them to root freely. If the wind or heavy rain loosens the shoots they can be pegged down.

RUBIACEÆ

Slender herbs (in Europe) with angular stems and entire leaves, in whorls of 4, 6, or 8, the buds and branches always opposite. Flowers small, in terminal or rarely axillary heads or panicles. Calyx more or less combined with the ovary. Corolla monopetalous, with 4 or 5 spreading lobes. Stamens as many, inserted in the tube. Ovary inferior. Style 2-cleft at the top, with a capitate stigma to each branch. Fruit of 2 1-seeded, indehiscent lobes.

One of the largest families, with perhaps 4500 species, but particularly numerous in the tropics, where it includes trees and shrubs as well as herbs.

Galium L.

Herbs with weak, quadrangular stems, sessile leaves in whorls of 4, 6, or 8, and small white, yellow, or reddish flowers in axillary or terminal cymes or panicles. Calyx combined with the ovary without any visible border. Corolla rotate, the tube scarcely perceptible, with 4 spreading lobes. Fruit small, dry, 2-lobed.

A large genus of about 200 species, spread over the whole of the temperate regions, and especially abundant in Europe and Northern Asia, and penetrating into the tropics.

Galium helveticum Weigg.

A densely turfy, prostrate or creeping species; glabrous, and turning yellowish when dried. Flowering stems slender, ascending. Leaves in whorls of 6–8, lanceolate and shortly mucronate, with scabrous margins. Apparently nerveless flowers, yellowish white, in small cymes. Corolla-lobes acute. Fruit glabrous and glossy, 2 mm. long. Sometimes forms cushions a foot across.

Rocky places, moraines, and on debris in the high Alps ; 6600–9000 feet ; more common on limestone. July, August.

Distribution.—Eastern, Central, and Western Alps.

Galium anisophyllum Vill. (*G. alpestre* R. and S.).

A glabrous plant, 2–8 inches high, turning rather black on being dried. Stems erect, rather rigid, shining. Leaves in whorls of 6–8 (of which 2 are usually shorter), linear-lanceolate, mucronate, with a dorsal nerve. Flowers white, in a short panicle, whose branches attain about the same height. Corolla-lobes shortly acuminate. Fruit glabrous.

Dry, rocky places up to 8500 feet. June to August.

Distribution.—Central and Western Alps and Pyrenees.

An extremely variable plant, considered by Briquet a var. *Gaudini* of *G. anisophyllum* Briq., which he calls a sub-species of *G. asperum* Schreb.

The most recent arrangement by Dr. Briquet of this difficult group of mountain Galiums is as follows :—

Galium asperum Schreber.
var. *argenteum* Briq. (*G. argenteum* Vill.).
var. *austriacum* Briq. (*G. austriacum* Jacq.).
var. *montanum* Briq. (*G. montanum* Vill.).

Sub-species *anisophyllum* Briq.
var. *Gaudini* Briq. (*G. anisophyllum* Vill.).
var. *Thompsonii* Briq. var. nov., *floribus roseis.*
(Mont Cenis, 6500 feet.)

Sub-species *tenue* Briq. (*G. tenue* Vill.).
var. *glabratum* Briq. (*G. tenue* Vill.).
var. *rhodanthum* Briq. in *Bull. Herb. Boiss.* 1902 [(Tessin).

All occur between 6500 and 8500 feet in the Western Alps, and most of them also in Switzerland and the Eastern Alps. Dr. Briquet's description of the new variety *G. Thompsonii* appears in the *Ann. du Conserv. Botan. de Genève,* 1907–8, and it differs from *G. rhodanthum* (which also has red flowers) in its leaves being clearly broadened below the summit, and by its less dense inflorescence, and it approached *G. anisophyllum,* while *rhodanthum* is nearer *tenue.* Unfortunately, I collected only one specimen of the new variety at Mont Cenis, and it has been divided between the Herbaria at Geneva (Conserv. Bot.), British Museum, and Edinburgh. Should any reader by chance come upon any such form elsewhere it would be interesting to hear. The actual spot at Mont Cenis was in a gully at the back of the Hôtel de la Poste, at about 6500 feet.

The Galiums are hardly worth cultivating, but several species of *Asperula* are more ornamental. *Asperula hexaphylla* All. is a rare and pretty little plant, with pink, trumpet-shaped flowers. It grows on limestone rocks about Tenda in the Maritime Alps, and also in some of the Eastern Alps.

A. longiflora W. and K. is somewhat similar, but larger and more robust. It is also a limestone rock plant of Central and Southern Europe, but much less rare than the last.

A. cynanchica L. var. *Jordani* Briq. is a pretty, bright pink form of this British plant, found from 4000 to 7000 feet at Mont Cenis and in Savoy. It grows either on limestone or on some siliceous rock.

VALERIANACEÆ

Herbs with annual or perennial stock, opposite leaves, and no stipules. Flowers in terminal corymbs or panicles, usually small and numerous. Calyx adherent to the ovary, sometimes toothed, but unrolling later into a feathery pappus. Corolla funnel-shaped, usually gibbous or spurred at the base. Lobes 3–5, unequal. Stamens 1–5. Ovary 3-celled, 2 of the cells being empty. Fruit small, indehiscent, 1-celled.

A family widely diffused over the greater part of the globe.

Valeriana L.

Stem-leaves opposite or whorled, entire or pinnatifid. Flowers in corymbose panicled cymes, unisexual or bisexual. Calyx-limb annular, developing a feathery pappus. Corolla usually 5-lobed, irregular, usually gibbous at the base. Stamens 3.

A large genus, with the geographical range of the family, but most abundant in mountain regions.

All the species mentioned are glabrous.

Valeriana supina L. (Plate XXXI.)

Stem erect, 1–3 inches high. Rootstock many-headed. Leaves glabrous, spathulate, entire or dentate, ciliate, the uppermost pair lanceolate, sessile. Flowers flesh-coloured, in a dense terminal capitate cyme surrounded by small leaves.

Damp places on high limestone Alps, 6600–9000 feet. July, August.

Distribution.—Eastern Alps and Canton Grisons; rare.

Valeriana saliunca All. (Plate XXXI.)

Stems erect, 2–4 inches high, with a pair of linear-lanceolate toothed leaves springing from a thick, woody rootstock, and throwing up dense tufts of lanceolate, entire, glabrous leaves. Flowers in a terminal, corymbose, paniculate cyme, pink. Crown covered with the scale-like remains of leaves. Very fragrant.

Rocky places on primary formations; local; 6000–9200 feet. July, August.

Distribution.—Tyrol (Brenner), Central and Western Alps.

Valeriana celtica L. (Plate XXXI.)

Stem 1–6 inches high, erect, simple, furrowed, with 1 or 2 pairs of leaves in addition to the bracts. Crowns covered with the scale-like remains of leaves. Leaves all entire, acute or obtuse; root-leaves obovate-lanceolate or wedge-shaped, narrowing into a foot-stalk; stem-leaves smaller, narrowly wedge-shaped, gradually narrowed towards the base, sessile. Flowers in a terminal paniculate cyme, dull reddish yellow.

Stony pastures of the higher Alps, 6500–9500 feet; especially abundant and characteristic on slate mountains, though occurring also on limestone; very local or rare.

Distribution.—Eastern Alps, occasionally in the Valais, as in the Saas Valley, Chermontagne, etc., and rarely in Savoy and Piedmont.

Known from antiquity for its perfume, which pervades the whole plant, and especially the root, and is still largely used in the Eastern Alps in baths, for perfuming clothes, protection against moth, etc. The gathering of 'Speick' is a considerable industry in the high mountains where the plant abounds.

Valeriana saxatilis L. (Plate XXXI.)

Rootstock with several tufted crowns. Stem erect, simple, furrowed, glabrous, leafless with the exception of the bracts, or with a single pair of leaves near the middle. Leaves all entire or coarsely toothed, acute or obtuse, glabrous or with scattered hairs, shortly ciliate; root-leaves elliptical or ovate-lanceolate, narrowed into a foot-stalk; stem-leaves much smaller, linear-lanceolate, sessile. Flowers in a terminal umbellate cyme, white.

Rocks in limestone mountains, 4000–7600 feet. June, July.

Distribution.—Carpathians; Eastern and Central Alps, including the eastern part of Switzerland; Erzgebirge, Balkans.

Valeriana tripteris L. (Plate XXXI.)

Rootstock with creeping runners. Stem erect, about a foot high, simple, furrowed, glabrous like the whole plant, or less often downy, with 3 or more pairs of leaves. Leaves of barren lateral tufts and lowest stem-leaves stalked, undivided, ovate or ovate-lanceolate, acute or obtuse, wavy or irregularly dentate, usually cordate at the base; upper stem-leaves with shorter stalks or sessile, 3-partite, divisions lanceolate, acute, irregularly toothed, the central one larger. Flowers small, reddish, sweet-scented, arranged in a terminal umbellate cyme.

Rocky places and pastures up to 6000 feet. May, June.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Vosges, Black Forest, Cevennes, Pyrenees, Corsica

Valeriana montana L. (Plate XXXI.)

Stem erect, 1–1½ feet high, glabrous like the entire plant, less often downy. Leaves in 3 or more pairs, all undivided, ovate or ovate-lanceolate, acute or obtuse, entire or unequally toothed; those of the barren shoots and the lower stem-leaves stalked, often

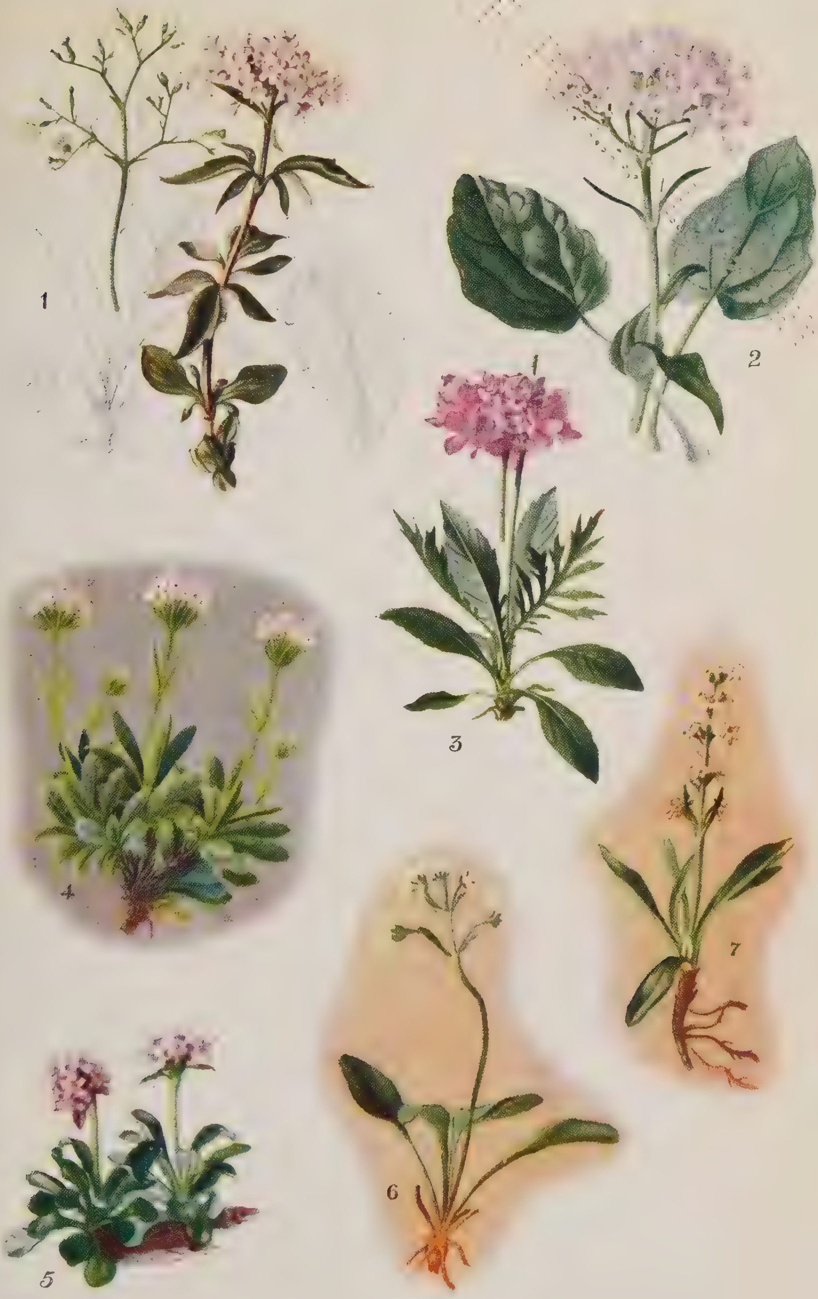

PLATE XXXI.

1. Valeriana tripteris L.
2. Valeriana montana L.
3. Scabiosa lucida Vill.
4. Valeriana saliunca All.
5. Valeriana supina L.
6. Valeriana saxatilis L.
7. Valeriana celtica Jacq.

cordate at the base; upper stem-leaves more shortly stalked or sessile, narrower, the uppermost lanceolate. Flowers usually pink, in a terminal corymbose cyme. The root has a strong odour.

Rocky, damp Alpine and subalpine places, descending to a low elevation; 3000–6500 feet; common. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps, Jura, Corbières, Pyrenees.

Valeriana elongata Jacq.

Stem 2–10 inches high, ascending, slender, furrowed, simple, glabrous like the whole plant, bearing 1 or 2 pairs of leaves, besides those of the inflorescence. Leaves all undivided, ovate or ovate-lanceolate; radical leaves narrowed into a foot-stalk, usually entire; stem-leaves larger, with shorter stalks, or sessile, coarsely dentate, rounded or cordate at the base, often almost subulate. Flowers yellow, in a terminal paniculate cyme. Root fragrant.

Clefts of rocks and debris, usually near the snowfields. July, August.

Distribution.—Eastern Alps.

Valerians are of little attraction in the rock garden.

DIPSACEÆ

Leaves opposite or whorled. Flowers small, collected into a capitulum, surrounded by an involucre of bracts. Calyx-limb cup-shaped, entire or lobed, surrounded by an involucel. Corolla funnel-shaped, 4–5 lobed. Stamens 4. Ovary 1-celled, with 1 pendulous ovule. Style filiform. Stigma capitate. Fruit indehiscent, 1-seeded.

A rather small family, spread over the ‘ancient world.’

SCABIOSA L.

Capitulum hemispherical or depressed. Outer flowers generally large and rayed. Involucel tubular, 4–5 lobed. Calyx-limb cup-shaped, with 4 or 5 stiff bristles or teeth. Corolla 4–5 lobed.

Scabiosa lucida Vill. (Plate XXXI.)

Stem 6–12 inches high, simple, erect, terminating in a single rose-violet or deep mauve capitulum, with large ray florets. Lowermost leaves elongated, stalked, crenate, rather shining, upper ones pinnatifid.

Pastures and stony spots in the Alps, 4500–8000 feet. June to September.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Erzgebirge, Vosges, Jura; Pyrenees.

A handsome species and well worth cultivating.

Cephalaria alpina Schrad.

A hairy, robust plant at least a yard high, with an ascending, angular stem, and pinnate leaves with from 9–15 lanceolate leaflets, serrated. Corolla pale yellow, in a dense globular head.

Rocky pastures in the Alps and sub-Alps up to 6000 feet; very local. June, July.

Distribution.—Switzerland, Jura, and Western Alps of Savoy, Dauphiny, Provence, and Piedmont.

COMPOSITÆ

Herbs or shrubs with alternate or opposite leaves, without stipules. Flowers or florets collected together into a head, surrounded by an involucre, the whole appearing like a single flower. The receptacle upon which the florets are inserted within the involucre is either naked or bears chaffy scales and hairs between the florets. In each floret the calyx is combined with the ovary, either completely so or only to appear at its summit as a short border, or more often as a *pappus* (or ring of feathery hairs). Corollas either all tubular or all *ligulate*, or the outer ones ligulate (*ray* florets) and the inner ones tubular (*disk* florets). Stamens 5 or rarely 4, inserted in the tube of the corolla. Anthers linear, and united in a sheath round the style. Ovary inferior, 1-celled, 1-ovuled. Stigmas 2. Fruit a small dry, seed-like nut, called an *achene*, either crowned by the pappus or naked.

The largest family, comprising about 12,000 species, and represented all over the globe, and in every kind of station.

The family is frequently subdivided into 2 sub-families:—

TUBULIFLORÆ and LIGULIFLORÆ

SUB-FAMILY: TUBULIFLORÆ

ADENOSTYLES Cass.

Stem leafy. Leaves alternate, stalked. Capitula numerous, forming a leafless corymb. Involucre of a few leaves, arranged in a single row. Flowers all tubular, red or white. Seeds nearly terete, striated.

Adenostyles albifrons Reichb. (Plate XXXII.)

Stem 1–2 feet high, erect, striated. Leaves large, stalked, reniform-cordate, coarsely and unequally doubly dentate, slightly tomentose beneath. Leaf-stalks often auriculate at the base. Capitula 3–6 flowered, collected into corymbose umbels. Flowers rose-purple.

Mountain woods and Alpine and subalpine pastures, 3300–5500 feet; common, especially on limestone. July, August.

Distribution.—Sudetic Mountains, Riesengebirge, Eastern, Central, and Western Alps; Jura, Vosges, Black Forest.

Adenostyles alpina Bluff. and Fing. (*A. glabra* (Miller) DC.). (Plate XXXII.)

Stem erect, 1–4 feet high, rather downy above, and often purple

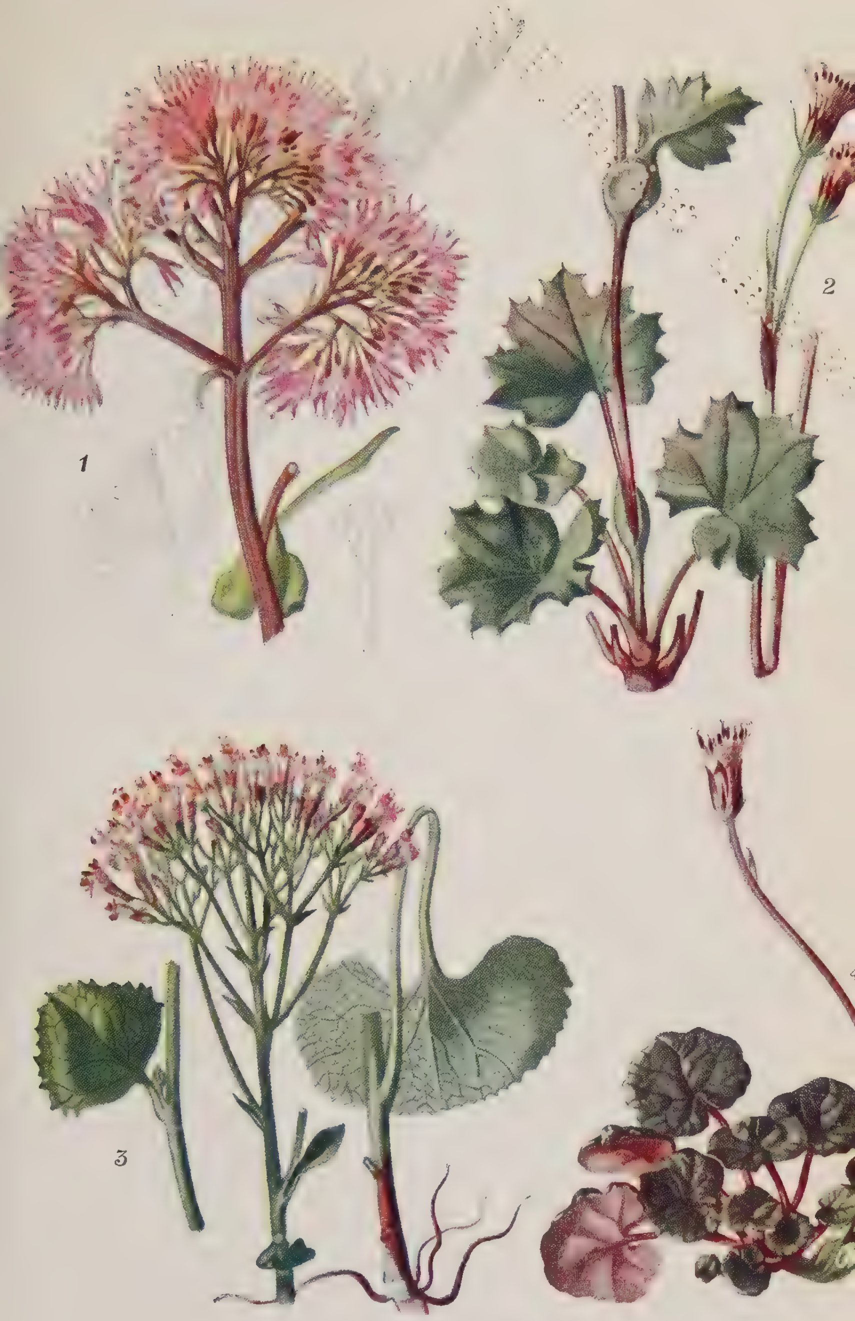

PLATE XXXII.

1. Adenostyles albifrons Reich.
2. Homogyne silvestris Cass.
3. Adenostyles alpina Bl.
4. Homogyne discolor Cass.

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like the involucres, ending in a much-branched, umbellate, paniculate, corymbose inflorescence. Leaves nearly round, kidney-shaped, or roundly triangular, regularly dentate, glabrous or with scattered hairs above, the uppermost leaves often lanceolate, dentate, reticulately veined on under side, and the veins thickly coated with hairs. Capitula 2–6 flowered, tufted. Flowers pink or flesh-coloured.

Moist, shady Alpine or subalpine places up to 8000 feet, and often descending to the valleys; limestone in preference. June to September.

Distribution.—Eastern, Central, and Western Alps, Jura; Corsica.

Adenostyles leucophylla Reichb. (*A. tomentosa* (Vill.) Schinz et Thellung.).

Stem 1–4 feet high, erect, slightly branched, cottony like the leaves. Leaves densely tomentose on both sides or sometimes only above, large, reniform-cordate, the lowest unequally toothed, the upper regularly indented with small teeth, and terminated by an apex not toothed. Capitula 15–20 flowered, crowded into a compact globular corymb, with linear bracts. Flowers pinkish.

Rocks and high, stony pastures in the siliceous Alps, 6000–9000 feet. July, August.

Distribution.—Central and Western Alps; local.

HOMOGYNE Cass.

Stem nearly leafless. Leaves mostly radical, stalked, round. Capitulum usually solitary. Involucre and receptacle as in *Adenostyles*. Seeds furrowed, nearly cylindrical.

Homogyne alpina Cass. (Plate XXXIII.)

Rootstock creeping. Stem erect or ascending, simple, with a single capitulum, woolly like the leaf-stalks, with 2–4 distant scales. Leaves radical, appearing at same time as the flowers, stalked, cordate-orbicular or reniform, dentate, glabrous on upper side, under side green, not tomentose, hairy on veins beneath. Flowers light purple-red, rarely white.

Damp, shady places on the Alps and lower Alps, and in mountain woods; extending up to 9000 feet. May, June.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Black Forest, Pyrenees.

Homogyne discolor Cass. (Plate XXXII.)

Rootstock creeping. Stem at first prostrate, then erect, simple, with a single capitulum, woolly like leaf-stalks, with 1–3 scales. Leaves radical, appearing with the reddish flowers, stalked, cordate-orbicular or reniform, dentate, purplish underneath, with a dense, dusky tomentum, glabrous and dark green above.

Pastures on the higher Alps. June, July.

Distribution.—Eastern Alps from Tyrol to Carinthia.

Homogyne sylvestris Cass. (Plate XXXII.)

Scape 10–12 inches high, with 1–3 capitula, downy, leafy below, scaly above. Root-leaves 2 inches broad, on long stalks, cordate-reniform, incised, 7–9 lobed, outer lobes pointed, inner lobes 3-toothed, with soft spines; stem-leaves smaller, semi-amplexicaule. Capitula up to 1 inch in length. Involucre purple-red. Branches of style warty. Pappus white.

Meadows and pastures up to 5000 feet; local. May, June.

Distribution.—Eastern Alps from Carinthia to Carniola.

Aster alpinus L. (Plate XXXIII.)

Stem erect or ascending, covered with short hairs like the leaves, thickened at the summit, and bearing a single capitulum. Leaves wavy, entire, wedge-shaped or spathulate, 3-nerved, obtuse; upper leaves linear-lanceolate, sessile, acute. Ray-flowers ligulate, violet or mauve, disc-flowers yellow. Capitulum handsome, 1½ to 2 inches across. Bracts of involucre lanceolate, more or less acute, all nearly uniform in length and herbaceous.

Rocks, stony places, and pastures in the Alps and lower Alps, 5000–9000 feet; more frequent on limestone. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Erzgebirge, Jura, Cevennes, Pyrenees.

Very easily grown in ordinary loam with some lime in it. Should be top-dressed in the spring, to prevent the shoots from growing out of the ground and getting broken by the wind.

Bellidiastrum Michelii Cass. (Plate XXXIV.)

Stem erect, leafless, simple, ending in a single capitulum, shaggy or covered with short, soft hairs, like the leaves. Leaves all radical, lanceolate-obovate, narrowed into a foot-stalk, coarsely serrate, obtuse, dull green. Capitulum rather large. Resembles a large daisy, but distinguished by the hairy pappus.

Damp, shady places, and clearings of woods from the subalpine regions upwards to 6500 feet, especially on limestone. May to autumn.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Black Forest, Var.

ERIGERON, L.

Capitula radiate. Disk yellow. Ray violet or mauve. Involucral bracts in many rows. Receptacle flat, pitted. Ray-flowers in several rows, ligulate. Disc-flowers bi-sexual. Pappus of many rows of hairs, persistent.

Erigeron uniflorus L.

Closely resembling the last in every respect, but more hairy, and with only 1 capitulum at the top of the erect, short, rather thick stems. The involucre is very woolly, and the bracts purplish.

Stony and sandy places in the high Alps, 7000–12,000 feet; recorded from 3800 metres on the Grivola (Vaccari). July, August.

Distribution.—Eastern, Central, and Western Alps, Corsica, Pyrenees; Europe from Spain to the Arctic regions.

var. *valesiacus* Sleicher.

This variety the writer has found as high as 11,200 feet (3414 metres) on the Aiguille du Goléon in Dauphiny.

Erigeron glabratus Hoppe and Hornsch.

Very similar to the last, but glabrous in all its parts, including the involucre. Capitula almost always solitary.

Pastures and rocks in the high Alps; local. July, August.

Distribution.—Eastern, Central, and Western Alps, Eastern Pyrenees.

Erigeron Villarsii Bell.

Is a taller species (8–12 inches), like a robust and branched *E. alpinus*. Pubescent-glandular above, and capitula 20–30 mm. in diameter, with reddish purple or rose ray-flowers.

Pastures in the Eastern, Central, and Western Alps, 5000–6500 feet; local. July, August.

Erigeron alpinus L. (Plate XXXIII.)

Stem erect, pubescent or glabrescent, usually bearing one flowering head, but branched at the top, so that some of its forms can with difficulty be distinguished from *E. Villarsii* Bell. Lower leaves entire, spathulate, obtuse, alternate, more or less hairy; upper leaves lanceolate, acute, sessile. Outer ray-flowers narrowly ligulate, nearly twice as long as the perfect disc-flowers; inner flowers tubular, filiform, equalling the disc-flowers in length. Disc yellowish. Ray florets mauve or purplish. Involucre hispid, not glandular. Very polymorphic, and with several named varieties.

The varieties of *Erigeron alpinus* L. are as follow:—

var. *grandiflorus* Briq. = *E. grandiflorus* Hoppe (1835).
var. *glabratus* Neilr. = *E. glabratus* Hoppe et Hornsch.
var. *intercedens* Briq.
var. *intermedius* Gremli = *E. intermedius* Schl.
var. *pleiocephalus* Willk.

The first four varieties I have found at Mont Cenis, and possibly they are widely distributed, but little known at present.

Alpine pastures and stony places, 5000–8500 feet. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Pyrenees; Central and Arctic Europe, Siberia (British).

Buphthalmum salicifolum L.

Stem 1½–2 feet high, branched at the top, and bearing several large yellow capitula about 2 inches across, with narrow, spreading ray flowers. Leaves lanceolate, undivided; upper leaves narrowed at the apex, acute, denticulate. Ray florets ligulate. Receptacle paleaceous. Pappus-hairs short, rough.

Dry, bushy places in subalpine situations, as e.g. the banks of the Lake of Lucerne, but ascending to about 6000 feet. Prefers a limestone soil, and is very suitable for cultivation and for gathering. July, August.

Distribution.—Central Europe.

Buphthalmum grandiflorum L.

Closely allied to the last, but less hairy, and with longer and more acuminate stem-leaves, which are also finely toothed. The receptacle scales are very acuminate; a few only are sub-truncate, with a shorter mucro. The yellow ray-flowers get broader towards the emarginate apex.

Woods and rocks in the Western and Southern Alps. July, August.

GNAPHALIUM L.

Flowers often unisexual and sometimes diœcious. Capitula small, usually in fascicled corymbs or cymes. Involucral leaves soft, adpressed, as long as the flowers. Receptacle flat, naked. Ray-flowers very slender, in one or more rows. Disc-flowers bisexual. Pappus-hairs in 1 row, slender.

Gnaphalium Leontopodium Scop. (Edelweiss). (*Leontopodium alpinum* Cass.) (Plate XXXIII.)

Stem erect, simple, 3–6 inches high, covered with a white woolly felt. Leaves entire, obtuse, more or less covered on upper side with whitish hairs, and on the under side with a white woolly felt; lower leaves narrowly wedge-shaped; upper ones linear-lanceolate. Capitula congregated in an umbellate manner at the apex of the stem, and surrounded by elliptical, woolly involucral bracts. The capitulum 1–1½ inch in diameter. Flowers whitish yellow.

Stony Alpine pastures, grass slopes, and steep rock precipices, especially on limestone; frequent and often locally abundant; 5000–8500 feet. July to September.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura; Pyrenees; Apennines; Northern Asia.

There is much sentiment about this plant, and hence it is getting ruthlessly gathered in many localities, though in Switzerland the taking of roots is forbidden. The plant is by no means one of the highest 'Alpines,' as is generally supposed by the uninitiated, nor does it necessarily grow in dangerous places. We know of one or two stations in Piedmont where it grows in an undulating, rocky

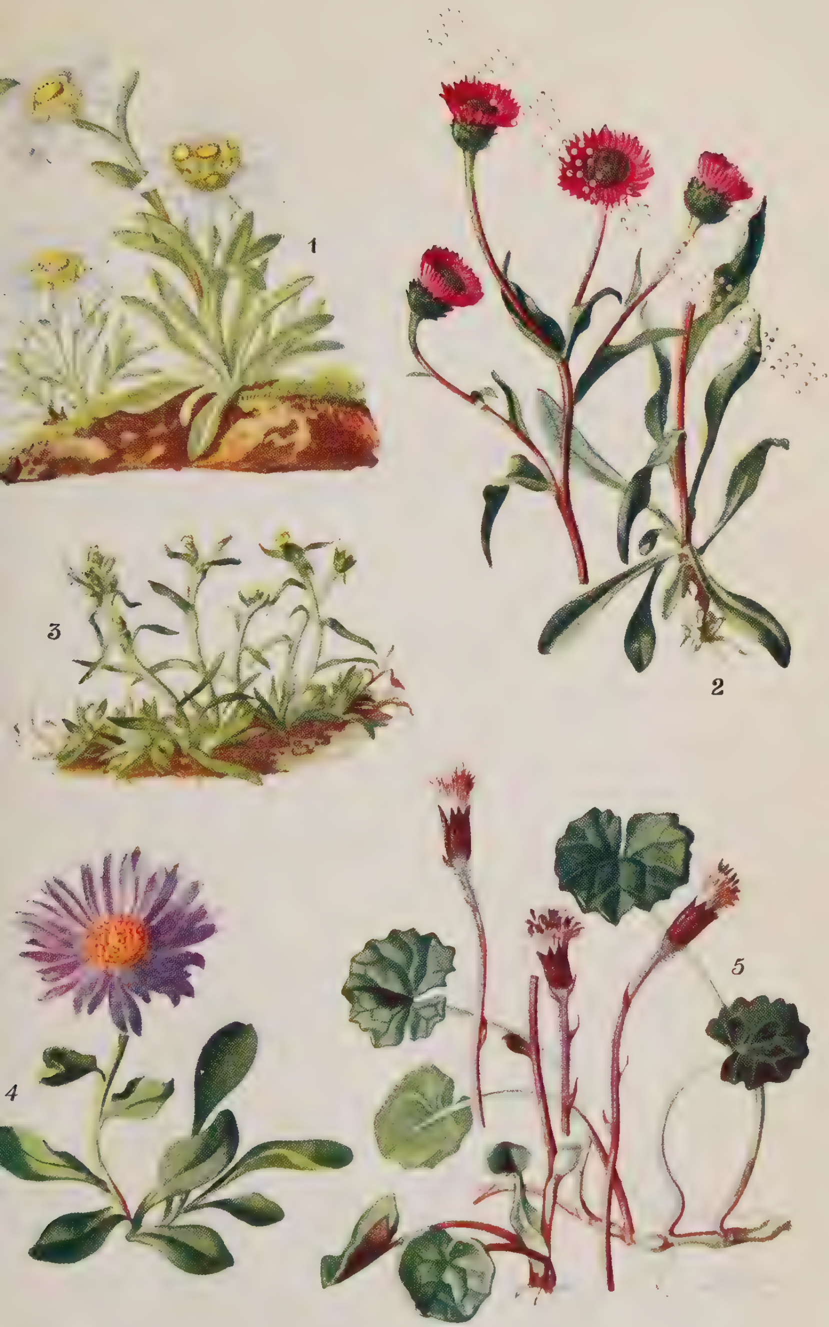

PLATE XXXIII.

1. Leontopodium alpinum Cass.
2. Erigeron Villarsii Bell.
3. Gnaphalium supinum L.
4. Aster alpinus L.
5. Homogyne alpina Cass.

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pasture, here and there, over acres of ground where children could romp.

Edelweiss is easily grown in England from seed, and has been known to flower well in a box on the top of a house in the centre of London. In the rock garden it should have an exposed place in the sun, in poor, gritty soil, with plenty of lime rubbish or mortar added. It will also grow on old stone walls if sufficient earth is mixed with the mortar.

Gnaphalium supinum L. (Plate XXXIII.)

A dwarf tufted or cæspitose species, with many flowering shoots 1–3 inches high, covered with white wool. Leaves linear or linear-lanceolate, entire, acute, spathulate, covered with a silky wool or nearly glabrous on upper side. Capitula ovate, from 1 to 5 collected into a short terminal spike. The outermost, brown involucral bracts are large, and cover about two-thirds of the capitulum.

Alpine rocks and pastures on primary formations, 5000–8500 feet. June to August.

Distribution.—Carpathians; Riesengebirge; Black Forest, Eastern, Central, and Western Alps, Jura, Corsica, Pyrenees, Apennines. (British.)

Gnaphalium Hoppeanum Koch.

Taller than *G. supinum* and not cæspitose. Leaves long, linear, woolly, white tomentose on both sides. Capitula in short, 3–5 flowered spikes. Outer involucral bracts about one-third as long as the capitulum.

High Alpine pastures, 6500–8800 feet. July to September.

Distribution.—Eastern, Central, and Western Alps, local.

Gnaphalium norvegicum Gunner.

Perhaps a sub-species of *G. silvaticum* L. Stem simple, erect, 6–12 inches high, very leafy. Leaves lanceolate, densely tomentose, especially beneath, 3-nerved, lengthened into a petiole; stem-leaves half as long as the lower leaves. Involucral bracts dark brown. Capitula in simple compact spikes.

Alpine pastures and woods between 5000 and 7800 feet. July, August.

Distribution.—Alps, Vosges, Auvergne, Pyrenees, Scandinavia, Scotland.

Antennaria carpatica R. Brown (*Gnaphalium carpaticum* Wahlb.). (Plate XXXIV.)

Stem 2–8 inches high, leafy, hairy. Leaves linear-lanceolate, entire, 2-nerved, woolly on both sides. Capitula 3–5 stalked, umbellate. Involucral bracts somewhat dry, brown, hairy, flat, apiculate.

Rocky Alpine declivities and pastures, 6000–8200 feet. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees, Norway, Lapland.

Antennaria dioica Gaertn. (*Gnaphalium dioicum* L.).

Similar to the last, but whiter, with creeping stolons and oboval, spathulate leaves; the upper ones only are lanceolate. The capitula are *white*, broad, obtuse, and spreading in the male, and *red* and acuminate in the female.

Mountain pastures and rocks in Central, Southern, and Arctic Europe, descending occasionally to nearly sea level in the British Isles, and attaining 9400 feet in the Alps. Also found in Russian Asia and North America.

A useful creeping plant for covering rocks and stones; it likes plenty of limestone.

ARTEMISIA L.

Capitula small, few-flowered in racemes or panicles. Involucral bracts in few rows, margins scarious. Receptacle very narrow. Flowers all tubular, outer female, inner male or perfect. No pappus. Bitter or aromatic herbs, often somewhat shrubby.

Artemisia spicata L. (Plate XXXV.)

Entire plant covered with silky white hairs, and forming dense cushions. Stem simple, ascending, 3–6 inches high. Root-leaves 3-partite. Segments many-cleft. Stem-leaves lanceolate, sessile, inciso-serrate. Capitula very small, collected into a compound capitate spike, each with 15–20 flowers. Involucral bracts densely woolly, with brown membranous margins. Flowers yellow. Corolla and achene hairy. An aromatic odour and bitter taste. Distinguished from *A. Mutellina* by the sessile inciso-serrate stem-leaves and floral leaves and the glabrous receptacle.

Sparsely distributed over the highest Alpine summits up to 12,400 feet. At 11,500 feet on the Combin de Corbassière (H. S. T.), and at even 3800 metres on the Grivola (Vaccari). July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Pyrenees.

Artemisia Mutellina Vill. (Plate XXXV.)

Cæspitose, many-stemmed. Stem simple, erect, 3–8 inches high. Leaves grey, with silky adpressed hairs, lowermost doubly or triply tripartite; upper leaves digitately divided. Segments all linear. Capitula 12–15 flowered, pale yellow, in a long, loose racemose spike, the lower heads on stalks ½ an inch long.

Rocky, exposed places in the high Alps, especially on granite; 6800–12,000 feet. July, August. (At 3760 metres on the Grivola.)

Distribution.—Eastern, Central, and Western Alps; Pyrenees; Balkans.

Artemisia glacialis L.

Cæspitose and tufted. Stem ascending, 3–4 inches high, with a few palmately digitate leaves, silky white like the whole plant, and somewhat shining. Leaves whitish on both sides, 3-partite and many-cleft. Stem-leaves with a long petiole, palmately digitate, the segments being linear-lanceolate. Capitula sub-globular, golden yellow at the head of the stem, more or less umbellate. 30–40 flowers in each capitulum.

Similar situations to the last; 7000–9500 feet. July, August.

Distribution.—Switzerland, and Western Alps as far south as the Maritime Alps; rare.

A. eriantha Ten. is a species allied to *A. spicata*, but taller, with more flowers in each capitulum, and a very woolly involucre.

It is found in the Western and Eastern Alps up to 9600 feet.

A. nana Gaudin is found rarely in the high Alps of Switzerland and Tyrol; and *A. nitida* Bertol. and *A. norica* Leyb. are only recorded from the Eastern Alps, where they are rather rare.

ACHILLEA L.

Leaves alternate, much divided or rarely simple. Flower-heads small, in a terminal corymb with white or pink rays and a yellow disc. Involucres ovoid or hemispherical, the bracts imbricated, slightly scarious at the edges. Receptacle small, not convex. Achenes without any pappus.

A considerable European and West Asiatic genus.

Achillea nana L. (Plate XXXV.)

About 4 inches high. Stem woolly, with a few leaves near the base. Leaves very woolly, narrowly lanceolate, pinnate. Pinnæ of the stem-leaves enlarged at the base by a lobe, bifid. Teeth linear-lanceolate, acute, unequal; those of the root-leaves bifid, the anterior tooth 3-cleft. Inflorescence simple, nearly globular. Ligulate flowers as long as the involucre; flowers white.

On the highest slate and granitic mountains; 6600–12,000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps. Found by Vaccari on the Grivola at from 3700–3800 metres.

Achillea Clavenæ L.

Stem erect, 3–8 inches high, leafy, and, like the leaves, covered with a grey felt of silky hairs, bearing at the summit a cluster of capitula in a corymbose cyme. Leaves obovate-lanceolate or wedge-shaped, simply pinnatifid, with linear teeth. Ray-flowers 6–8, as long as the involucre or longer. Capitula large. Involucral bracts with a black margin; ray white, disc greenish yellow.

On rocks and debris of the calcareous Alps; 5000–7000 feet. Common (in the Eastern Alps), and sometimes descending the valleys.

Distribution.—Eastern and Central Alps. In Switzerland only on Monte Generoso.

Achillea Clusiana Tausch. (Plate XXXV.)

Glabrous or slightly hairy. Stem ascending, simple, leafy, covered with soft hairs. Stem-leaves sessile, all the leaves doubly pectinate, with large indentations. Segments acute, pinnatifid or doubly pinnatifid. Capitula few-flowered. Flowers white.

Moist pastures and stony places on calcareous Alps, 5200–7400 feet. July, August.

Distribution.—Eastern Alps from Salzburg to Carniola.

Achillea atrata L. (Plate XXXV.)

Rootstock creeping. Stem erect or ascending, 3–6 inches high, covered, like the leaves, with patent hairs, or nearly glabrous. Capitula in a branched umbel, few-flowered. Leaves lanceolate in outline, doubly pinnatifid. Segments linear, acuminate. 8–10 ray-flowers as long as or longer than the involucre. Flowers dusky white. Involucral bracts lanceolate, with a dark brown margin.

High pastures of the Alps, especially on limestone, 5300–11,500 feet, or even 4000 metres (Schroeter). July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, but not further south-west than Haute-Savoie and Piedmont.

Achillea moschata Jacq. (Plate XXXIV.)

Glabrous or somewhat hairy. Stem ascending, 3–6 inches high, leafy, with soft hairs. Leaves doubly pectinate. Segments linear, with deep indentations. Inflorescence a crowded pseudo-umbel of small white capitula with broad rays and brown calyx-scales. Fragrant.

Moist, grassy places on high granitic Alps; rather rare; 6600–11,200 feet. July, August.

Achillea Herba-Rota All.

Stem from 6–9 inches high, springing from a woody, rampant, and stoloniferous stock. Leaves undivided, sessile, narrow-cuneate, with a few simple serratures on the upper half; stem-leaves sessile, oblong, obtuse, with very long, spreading teeth at the base. Corymb simple, few-flowered.

High rocky pastures in Savoy, Dauphiny, and Piedmont. July, August. Usually at about 6500–8200 feet.

These Alpine Achilleas, and also *A. Huteri*, can be grown in sandy loam with plenty of grit in any sunny place on the rockery, provided they get a top-dressing once or twice in the season.

Achillea macrophylla L.

Stem 2–3 feet high, erect, terete, leafy. Leaves pinnatifid, large, deeply and much divided; the lower leaves ovate-triangular in outline, pinnatipartite, with 3–7 segments, the inferior segments

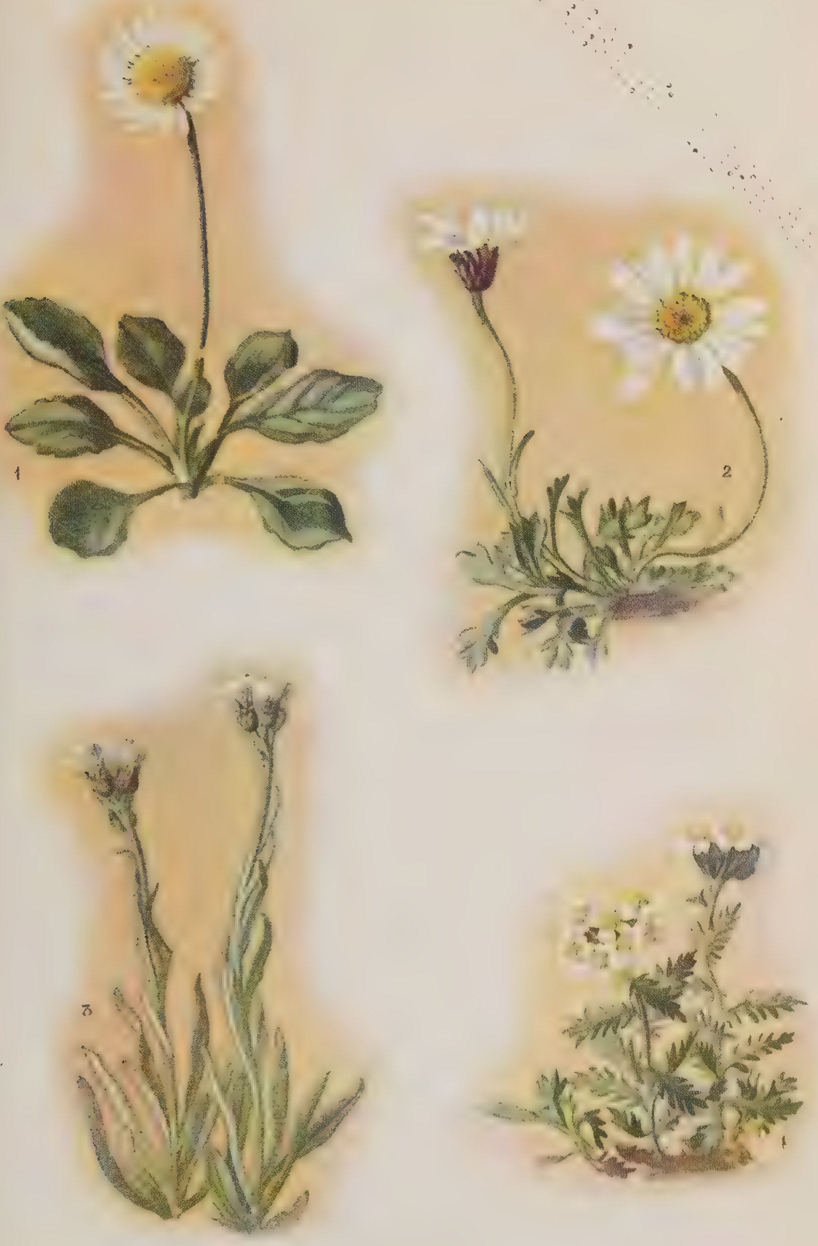

PLATE XXXIV.

1. Bellidiastrum Michelii Cass.
2. Chrysanthemum alpinum L.
3. Antennaria carpatica R.Br.
4. Achillea moschata Wulf.

being distinct, the upper confluent, sharply toothed; uppermost leaves narrow, lanceolate, not divided, but sharply toothed. Corymbs very compound. Flowers white, small.

Woods and shady places in the Alps and sub-Alps, 3000–6800 feet.

Distribution.—Eastern, Central, and Western Alps; local.

A useful subject for planting in the shade of trees at the back of a rockery, for the foliage is rather handsome.

Chrysanthemum (*Leucanthemum*) *alpinum* L. (Plate XXXIV.)

Stem 2–6 inches high, ascending, bearing a single capitulum, naked above, usually downy below. Leaves stalked, spathulate, incised at the apex, toothed, the uppermost linear. Pappus of the achenes about one-third or half as long as the tube of the ray-flowers, which are white and expanded, about 1½ inch across; disc yellow. Tufted and nearly glabrous, most of the leaves resting on the ground.

Pastures and debris on the Alps; abundant on siliceous rocks; 6000–12,000 feet. July, August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Pyrenees; Transylvania.

Of very easy culture in a well-drained southerly position, a compost of sand and loam suiting it well. It does best on a sloping bank. It often gets lost for want of top-dressing once a year in spring.

DORONICUM L.

Root-leaves stalked or 0; stem-leaves amplexicaul. Capitula solitary or in corymbs, rayed. Ray-flowers ligulate, usually female; disc-flowers with free branches of style. Receptacle conical. Fruit furrowed.

The nomenclature of the Alpine species of *Doronicum* (or *Aronicum*) appears much confused.

Doronicum cordifolium Sternb. (*D. cordatum* Schultz). (Plate XXXV.)

Stem 1½–3 feet high, erect, simple or branched, more or less covered with soft hairs or nearly glabrous. Stem-leaves wavy at the margin or toothed, lanceolate, acute; lower leaves cordate-ovate, stalked; upper ones cordate-lanceolate, sessile, amplexicaul, spathulate or nearly fiddle-shaped. Flowers yellow. Capitula large and handsome, 2 inches across.

Mountain woods, and shady Alpine and subalpine situations, 3000–6500 feet; local. June to August.

Distribution.—Carpathians, Sudedic Mountains, Eastern Alps.

Doronicum Clusii (All.) Tausch. (*Aronicum Doronicum* Jacq.). (Plate XXXVI.)

Rootstock bitter, often with underground stolons. Stem about a foot high, hollow, covered with rough hairs like the leaves, simple, leafy. Leaves lanceolate; root-leaves often oval, entire or coarsely dentate, or with a wavy margin; lower leaves stalked, narrowed below or auricled, upper ones with a narrowed or a rounded base, sessile, decreasing in size upwards. Capitulum solitary, large and handsome, bright yellow.

Rocks and stony pastures and on debris on the granitic Alps, 5600–7600 feet. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Spanish Pyrenees.

Doronicum scorpioides (L.) Koch (*A. scorpioides* DC.).

Stem hollow, 12–18 inches high, covered with hair like the leaves. Leaves soft, entire or distantly toothed, the inferior petioled, oval, obtuse, with a truncate or cordate base; the middle leaves smaller, and embracing the stem with 2 entire or toothed auricles; the uppermost leaves oval-lanceolate, sessile, amplexicaul. Involucral bracts linear. Capitulum large, solitary, with yellow flowers.

Rocks and screes in calcareous mountains, from 6500 to 9000 feet. July, August.

Distribution.—Alps, Carpathians, Balkans, Pyrenees, Spain, Corsica.

This is a handsome plant for half-shady places in the rock garden. Pieces of limestone or old mortar should be mixed with the soil, which must be well drained.

Aronicum glaciale Reichb.

In some of the older books, and in Gremli's *Flora of Switzerland*, this is given as a species found on the high primary rocks, but we believe the name can be dropped, at any rate as far as Switzerland is concerned. It may be one of the numerous synonyms for *Doronicum Clusii.* Koch first called it a var. of *Clusii* and then of *scorpioides.*

Arnica montana L. (Plate XXXVI.)

Stem erect, 1–1½ feet high, glandular-villous, bearing 1–3 capitula, and 1 or 2 pairs of small leaves, naked above. Leaves entire, oval-lanceolate or oblong-lanceolate, glabrescent, narrowed into a short foot-stalk, and forming a rosette. Stem-leaves opposite, lanceolate, sessile, much smaller. Flowers bright orange-yellow. Capitula 2–2½ inches in diameter, though frequently not perfect. A well-known, bitter medicinal plant.

Alpine and subalpine pastures and clearings in woods, 3400–8000 feet. Especially on granitic or siliceous soil, where it is sometimes very numerous. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Erzgebirge, Black Forest, Vosges, rare in the Jura, Cevennes, Pyrenees, and the greater part of Europe as far north as Sweden; Northern Asia.

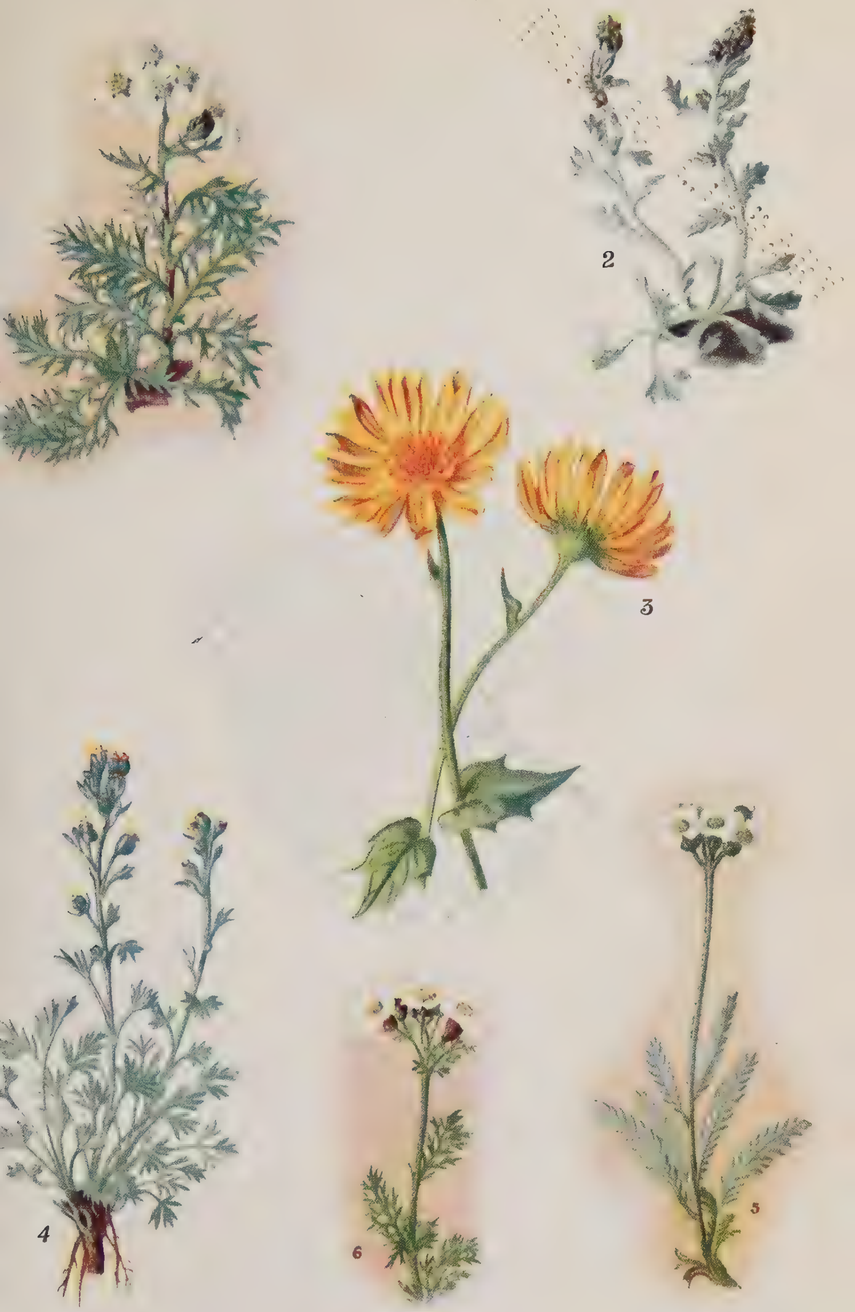

PLATE XXXV.

1. Achillea atrata L.
2. Artemisia spicata Wulf.
3. Doronicum cordatum Schultz (D. cordifolium Sternbg).
4. Artemisia Mutellina Vill.
5. Achillea nana L.
6. Achillea Clusiana Tausch.

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Easily grown in deep soil; a mixture of loam and peat or leaf-mould is best. Increased by seed or by division.

SENECIO L.

Leaves alternate, toothed or divided, rarely entire. Flower-heads in terminal corymbs. Disc-florets yellow, and tubular ray-florets yellow, blue, purple, or white, spreading. Involucre cylindrical or nearly hemispherical, with 1 or 2 rows of linear bracts, often tipped with brown. Receptacle without scales. Achenes cylindrical, with a pappus of simple hairs, usually soft and white.

One of the largest genera, if not the largest, in existence, and spread over the whole globe, though most of the species are confined to a small area only. Several species which have not the small outer bracts to the involucre were distinguished by Linnæus under the name of *Cineraria*, but the character has proved so uncertain that modern botanists have given it up.

Senecio incanus L. (Plate XXXVI.)

Stems 2–4 inches high, simple, and covered with a white felt like the leaves. Root-leaves and lower stem-leaves stalked, lanceolate, pinnatifid, segments obtuse, entire or crenate; upper leaves shortly stalked, without auricles, segments linear, obtuse. Capitulum, solitary or in pairs, forming a dense compound corymbose raceme. Achene glabrous. Flowers yellow.

High pastures, snowy hollows, dry beds of mould and rock debris, from about 6000 to 12,000 feet. July, August.

Distribution.—Switzerland and Western Alps; local.

Found by the present writer as high as 12,000 feet, just 200 feet below the summit of the Combin de Corbassière in Switzerland.

Senecio carniolicus Willd. (Plate XXXVI.)

Entire plant grey, from an adpressed, almost silky, felt. Leaves at length glabrous. Rootstock many-headed, putting out sterile tufts of leaves and stems, 1–4 inches high. Root and lower stem-leaves lanceolate wedge-shaped, stalked, inciso-crenate or pinnate, pinnæ obtuse, entire or crenate; upper leaves shortly stalked, pinnæ linear, acute. Flowers bright yellow. Fruit glabrous. Hairs of the pappus broader than in *S. incanus*.

Stony pastures on the primary Alps, 6000–10,000 feet. July, August.

Distribution.—Carpathians, Eastern and Central Alps, but only in Switzerland in Tessin and Grisons.

Senecio uniforus All.

A small plant covered with a grey or white tomentum. Lower leaves petioled, oblong-ovate, crenate, incised or with obtuse lobes; the upper stem-leaves entire, small, lanceolate, and like bracts. All covered on both sides with a dense white tomentum. Capitulum large, solitary, yellow. Fruit hairy.

Alpine rocks from 6500 to 8500 feet; rare. July, August.

Distribution.—Southern Tyrol, Simplon, Saas, Zermatt, Savoy, Hautes-Alpes, and Piedmont.

Senecio Doronicum L.

Polymorphic. In high situations generally covered with a grey felt, but becoming glabrescent sometimes in shadier places in lower altitudes (see notes by R. Farrer, W. Irving, and the author, in *Gardeners' Chronicle*, 1910, p. 56).

Leaves thick, often cottony below, entire or toothed; lower leaves oblong, obtuse, prolonged below into a petiole, the next sessile, lanceolate, semi-amplexicaul. Ray-flowers 10–20, orange-yellow. Outer involucre with 10 or more bracts.

Rocky places and pastures, especially on calcareous mountains, 5000–8200 feet; frequent. July, August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Spain, Southern Jura, Central Europe, North-west Balkans.

Senecio abrotanifolius L. (Plate XXXVI.)

Stem shrubby at the base, annual shoots 3–12 inches long, glabrous or slightly downy like the leaves, corymbosely-branched above, with 2 or more capitula, less often with a single capitulum. Lower leaves bi-pinnate, stalked, dark green, shining, finely and deeply divided; upper leaves simply pinnate, sessile, teeth narrowly linear, acute. Paleæ about half length of involucral bracts. Ray-flowers spreading. Capitula large, orange-yellow.

On rocks, between stones, and on debris of the calcareous Alps, 1200–1600 metres. July to September.

Distribution.—Carpathians, Eastern Alps, and Switzerland, but only in Tessin, Grisons, Appenzell, and Zermatt Valley.

Senecio subalpinus Koch.

Glabrous. Stem 1–2 feet high, with large leaves, somewhat woolly beneath, and golden yellow flowers. Lower leaves triangular, sagittate or cordate, longer than broad, coarsely toothed, stalked; upper leaves lyrate-pinnatifid or pinnate, auricled. Achenes glabrous.

Alpine and subalpine pastures. July, August.

Distribution.—Carpathians and Eastern Alps.

Senecio alpinus Scop. (*S. cordifolius* Clairv.).

Stems 1–2 feet high. Leaves undivided, cordate-ovate, serrate, longer than broad, unequally dentate, lowermost webbed; leaf-stalk auricled at the base, often with triangular appendages. Several medium-sized capitula. Flowers yellow.

Alpine and subalpine pastures, especially near chalets and borders of woods; 4300–6500 feet. July, August.

Alpine zone of Central Europe, but local, and not occurring in many large mountain areas.

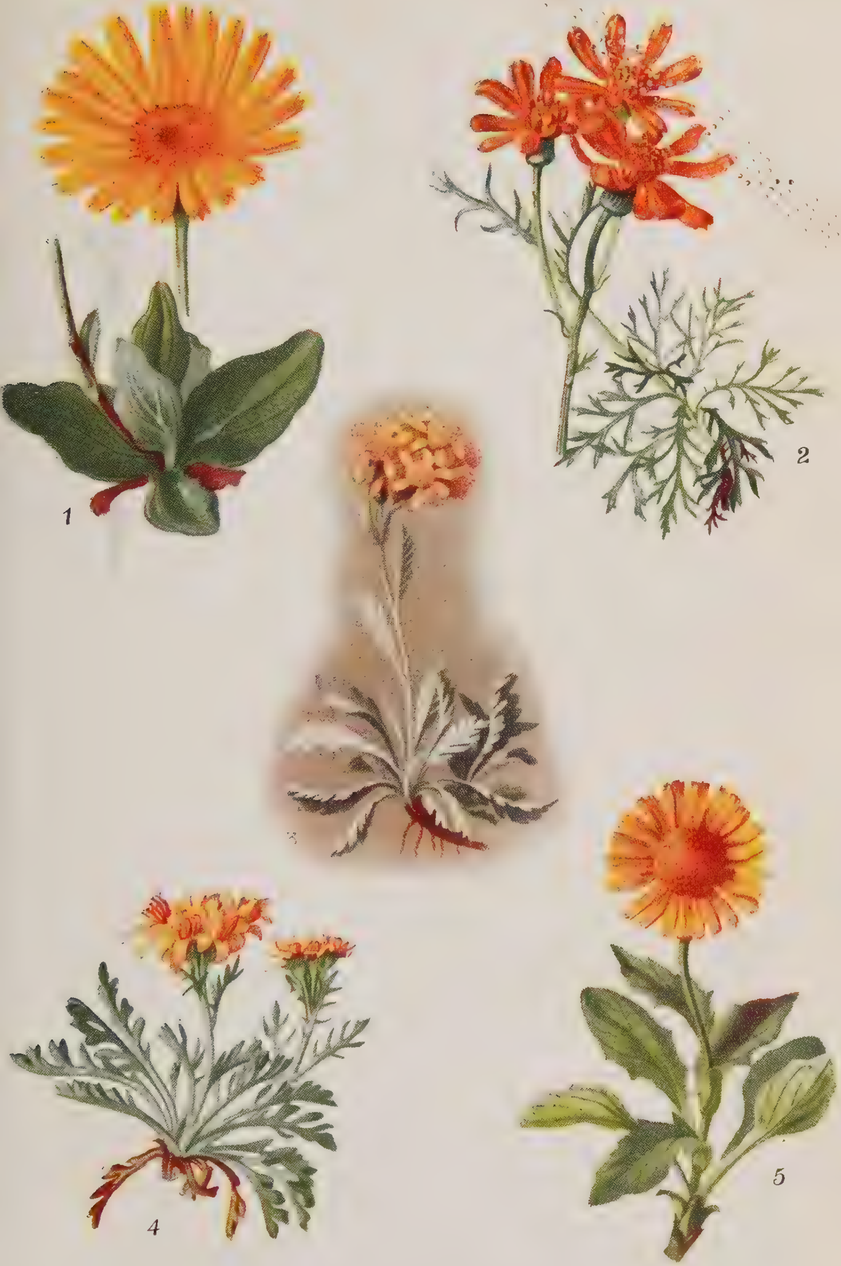

PLATE XXXVI.

1. Arnica montana L.
2. Senecio abrotanifolius L.
3. Senecio incanus L.
4. Senecio carniolicus Willd.
5. Doronicum Clusii Tausch.

Senecio Fuchsii Gmelin.

A tall plant, 3–4 feet high, with oblong-lanceolate, toothed leaves, attenuated and sometimes sub-petioled at the base, but never amplexicaul. Stem-leaves lanceolate-acuminate. Numerous capitula in a large, loose corymb. Ligules 3–5 in number, yellow, one being longer than the rest.

Mountain gorges and woods, especially in the subalpine region. July to September.

Distribution.—Central and Western Alps, Switzerland, Jura, and many districts in Central Europe.

We have seen this plant at elevations of from 6000 to 7000 feet above La Grave in Dauphiny, and on the Joch and Surenen Passes in Switzerland, and it is very abundant in the picturesque Gorge of Trient which skirts the Tête Noir.

Senecio nemorensis L.

Schinz and Keller say this is fairly distributed in Switzerland in woods and damp gorges, especially in Alpine valleys and in the Jura, and it is frequently confounded with the last species. It grows in similar places, but flowers rather earlier, and the leaves are rather broader.

S. aurantiacus DC. (*Cineraria aurantiaca* Hoppe). Plate XXXVII.)

Stem 6–18 inches high. Lower leaves ovate or lanceolate, nearly glabrous, grass-green or greyish, flocculent, most of them narrowed into a short, broad leaf-stalk. Capitulum about an inch in diameter. Flowers orange-red or rarely yellow. Involucral bracts tinged with purple entirely or only at the tip, woolly at the base.

Alpine and subalpine meadows and pastures; local. June, July.

Distribution.—Carpathians; Eastern, Central, and Western Alps. In Switzerland on some of the southern calcareous Alps.

S. alpestris DC. (*Cineraria alpestris* Hoppe). (Plate XXXVII.)

Stem erect, 10–18 inches high, umbellate at the summit, with 3 or more capitula, covered like the leaves with long wool and short, thickish hairs. Leaves entire, wavy or toothed, ovate, running into the leaf-stalk, obtuse; upper leaves linear-lanceolate, sessile, acute. Peduncles of the capitula naked. Outer ligulate flowers radiate, yellow, but often wanting. Ovary and achenes glabrous.

Alpine and subalpine pastures and meadows; frequent. June, July.

Distribution.—Carpathians, Eastern Alps.

Senecio longifolius Jacq. (*Cineraria longifolia*).

Stem erect, simple, striated, 1–2 feet high, woolly. Capitula 5–8, in simple umbels, yellow, an inch across. Lower leaves ovate-lanceolate, crenate, stalked ; upper leaves linear-lanceolate, entire ; leaves more or less downy. Ovary and fruit downy.

Alpine meadows and pastures ; 3500–5600 feet ; local. June.

Distribution.—Carpathians, Eastern Alps.

Inula montana L.

About a foot high, and resembling *I. britannica*, but with only one terminal capitulum, and leaves almost linear, not amplexicaul. The involucre is imbricate and the fruit twice as large as in that species. Lower leaves oblong-lanceolate, longly petioled, and whole plant covered with whitish hairs. Capitulum large and handsome. Flowers bright yellow, the linear ligules being much longer than the involucral bracts, which are very unequal.

Dry, arid places on limestone in the Western Alps, Eastern Pyrenees, Spain, and Piedmont. Formerly near Martigny, but now not nearer Switzerland than the Aosta Valley. June, July.

Not an 'Alpine,' but very suitable for introducing in the rock garden, for its yellow heads are distinctly handsome.

Cirsium spinosissimum Scop. (Plate XXXVII.)

Stem erect, 1–2 feet high, densely leafy, bearing from 3 to 6 capitula, floccose. Leaves amplexicaul, pinnate, spinosely toothed, with woolly bristles on the veins on the under side. Capitula crowded, sessile among the leaf-like very spiny, etiolated, greenish white involucral bracts. Inner involucral bracts erect, spiny at the apex. Flowers dull yellow.

Damp Alpine meadows and pastures and borders of streams, sometimes reaching as high as 9000 feet. (Aiguille du Goléon.)

Distribution.—Eastern, Central, and Western Alps, Jura. July to September.

Cirsium acaule Scop.

This dwarf, stemless (British) Thistle sometimes attains 6800 feet in the Alps, especially on limestone.

Carduus defloratus L.

Perhaps the commonest Thistle in Alpine districts. Stem 12–18 inches high, pubescent and naked for a long distance above and bearing a single terminal capitulum. Leaves glabrous, glaucous below, lanceolate-acute, pinnatifid and deeply lobed, the segments being distant, ciliate-spinous. Wing of leaves broad at base and then suddenly narrowed. Involucral bracts ovate, tip of innermost bracts thin, not spiny. Fruit 3 times as long as broad. Capitulum solitary and very longly peduncled. Flowers purple.

Alpine and subalpine meadows and pastures (up to 8700 feet on the Col du Galibier) and in clearings of woods. July to September.

Distribution.— Eastern, Central, and Western Alps, Jura, Pyrenees.

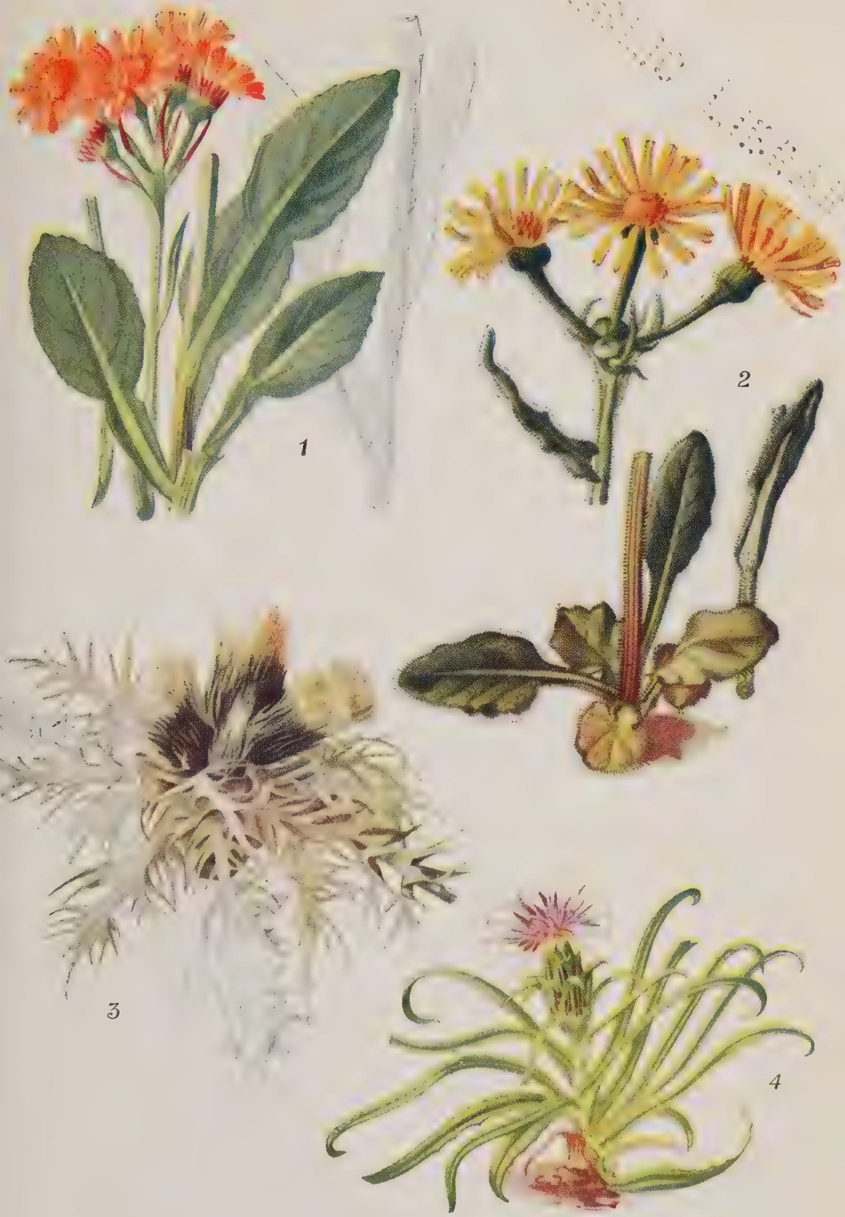

PLATE XXXVII.

1. Cineraria aurantiaca Hoppe.
2. Cineraria alpestris Hoppe.
3. Cirsium spinosissimum Scop.
4. Saussurea pygmæa Spr

Carlina acaulis L.

Biennial. Stem simple, very short or wanting, or occasionally 6 inches high, in which case it is leafy, bearing a single terminal head. Root-leaves shortly petioled, lanceolate, pinnatifid, glabrous and very spiny, and forming a large rosette. Capitulum large and handsome, sometimes 3 or 4 inches in diameter when expanded. Inner involucral bracts linear and of a beautiful silver white, brownish at the base.

Dry Alpine pastures, especially on limestone (often abundant), up to 8200 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Jura, Spain, Central Europe from Alsace to the Var.

The silvery grey heads of this handsome Carline Thistle are very decorative, and useful to adorn ladies' hats. It can be grown from seed, but is biennial.

SAUSSUREA DC.

A small genus of high Alpine plants dedicated to de Saussure, the Geneva naturalist of Mont Blanc fame.

Saussurea pygmæa Spreng. (Plate XXXVII.)

Rootstock thick, without runners. Stem 1–6 inches high, erect, and bearing a single capitulum, covered with a dense felt. Leaves sessile, linear or linear-lanceolate, acute, entire or somewhat denticulate, recurved at the margin, nearly glabrous on upper side, paler and with long, scattered hairs on under side. Involucral scales ovate-lanceolate, loose, not spiny, floccose. Flowers pale violet.

Stony pastures on the calcareous Alps; 7400–9300 feet; rare and local. July, August.

Distribution.—Eastern Alps.

Saussurea alpina DC.

Stem up to 1 foot high, with distant leaves, cottony. Leaves lanceolate, attenuated at both ends, toothed, grey-felted beneath, the lower leaves petioled. Involucral bracts narrow, acute, green, with black tip or uniformly brown. Flowers reddish purple. Capitula stalked and forming a dense umbel.

Damp, grassy places in the high Alps; 6500–8500 feet, particularly on primary rocks. July, August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Scandinavia. (British.)

Saussurea depressa Gren.

Perhaps only a variety of *alpina* (see Schinz and Keller). Much shorter and more compact, with closely packed leaves. Stem 2–6 inches, springing from a recumbent base. Leaves oblong-lanceolate, toothed, and reaching to the top of the dense corymb. Grey-felted as in *alpina*. Capitula sub-sessile. Flowers purple.

Rocky places in the high Alps, especially on slate or gneiss; 9100–9800 feet, on the Aiguille du Goléon; rare. July to September.

Distribution.—Eastern, Central, and Western Alps.

Saussurea discolor DC.

Stem about a foot high, erect. Leaves broadly lanceolate, with cordate or truncate base, shortly stalked, snow-white tomentum beneath, green and nearly glabrous above, toothed; stem-leaves sessile, linear-lanceolate. Capitula corymbose. Involucral bracts ovate. Flowers light violet.

Rocks on high calcareous Alps; rare; 6600–8700 feet. July, August.

Distribution.—Eastern, Central, and Western Alps.

CENTAUREA L.

Involucral bracts imbricate, scarious, fringed or spiny. Receptacle bristly. Flowers all tubular; outer ones usually larger, neuter; inner ones perfect. Fruit compressed.

One of the largest genera, and especially numerous in the Mediterranean and Caucasian regions, with a few American species.

Centaurea montana L. (Plate XXXVIII.)

Stem about a foot high, erect or ascending, simple or slightly branched above, covered with a grey woolly felt like the leaves. Leaves soft, lanceolate, acute or acuminate, entire; lower leaves narrowed into a foot-stalk, slightly webbed; upper stem-leaves decurrent. Involucral bracts ovate or lanceolate, anastomosely veined, adpressed, with a membranous margin at the apex, fringed or serrate. Pappus one-third as long as the achene. Ray-flowers bluish, rarely white; disc-flowers purple or pink.

Alpine and subalpine meadows and pastures, and margins of woods, especially in stony, bushy places; common.

Distribution.—Eastern, Central, and Western Alps, Vosges, Erzgebirge, Jura, Cevennes, Pyrenees.

Centaurea axillaris Willd. (*C. variegata* Lam.).

Very similar to the last, but with pinnatifid lower leaves and oval involucral bracts, which have a brown margin with cartilaginous, silver-white teeth. Flowers blue, rarely red or white.

Dry places and wood clearings up to 5300 feet; local.

Distribution.—Switzerland and Western Alps. July, August.

Centaurea uniflora L.

Stem 8–12 inches high, erect, simple, and always 1-headed, cottony. Leaves white-cottony on both sides, 1-nerved, oblong-lanceolate, entire or obscurely toothed, the lower leaves prolonged into a petiole, upper leaves sessile. Involucre large, sub-globular. Bracts dark brown, with the fringed, linear-subulate apex very long and completely turned back. Cilia of bracts long and plumose.

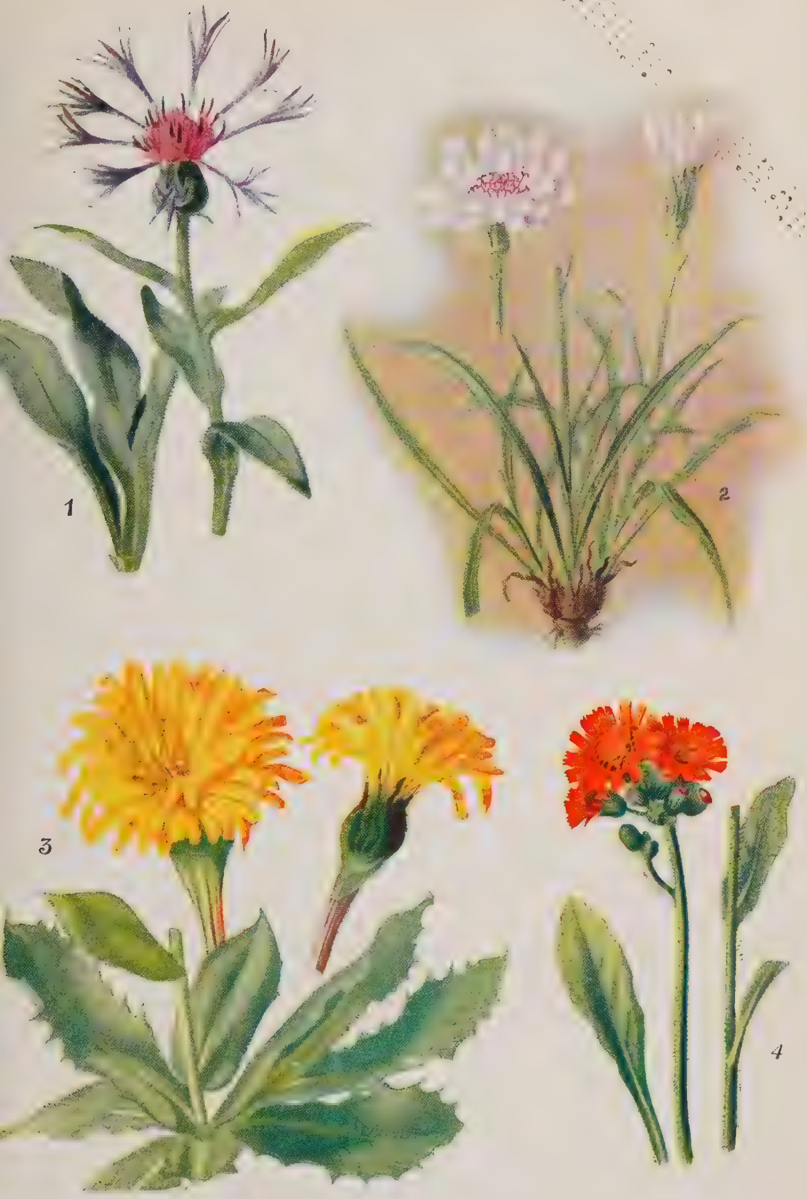

PLATE XXXVIII.

1. Centaurea montana L.
2. Scorzonera rosea W. et K.
3. Hypochæris uniflora Vill.
4. Hieracium aurantiacum L.

Flowers bright purple. Before they expand the involucral bracts form a curious feathery ball.

Alpine pastures and meadows, 5300–8200 feet. July to September.

Distribution.—Central and Western Alps as far south as the Maritime Alps.

Centaurea nervosa Willd.

Resembling the last, but more robust and hispid, and of a grey-green colour. The leaves have prominent nerves on the under side, and are irregularly toothed, the stem-leaves being broader and truncate or auricled at the base.

High pastures up to 7700 feet or 2350 metres. July to September.

Distribution.—Eastern, Central, and Western Alps; local.

This occurs in Switzerland, and is considered by the modern Swiss botanists a sub-species of *C. uniflora*, which does not occur in their country.

SUB-FAMILY: LIGULIFLORÆ

Aposeris fœtida Less.

Stem erect, leafless, glabrous like the leaves, bearing a single capitulum, pendent before flowering. Leaves wedge-shaped in outline, forming a sort of rosette, runcinate-pinnatifid, lateral segments nearly triangular or lozenge-shaped, terminal segment broad, 3-lobed. Flowers lemon-yellow, twice as long as the involucre. Fœtid. Involucre green, herbaceous, with an exterior involucre of small scales. An herbaceous plant resembling the dandelion in appearance.

Moist, shady Alpine and subalpine situations. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps.

LEONTODON L.

Capitula on simple or branched, leafless scapes. Flowers yellow. Leaves all radical. Fruit terete, with a short beak. Pappus-hairs rigid, in 1 or 2 rows.

Leontodon pyrenaicus Gouan.

Stem erect, leafless, glabrous like the leaves, upper part with several subulate scales. Leaves all radical, entire or wavy, and slightly pinnatifid, linear-lanceolate or wedge-shaped, acute, narrowed into a naked leaf-stalk, occasionally with a few simple hairs. Corolla golden yellow or orange-red (var. *crocea* Hænke). Inner pappus-rays feathery.

Alpine meadows and pastures up to 8600 feet. July, August.

Distribution.—Carpathians; Eastern, Central, and Western Alps, Black Forest, Vosges.

Leontodon Taraxaci Lois. (Plate XXXIX.)

Root big, oblique, with thick fibres. Scape 2–4 inches high, thick, simple, often curved, glabrous at the base, hairy, and broadly dilated under the single capitulum. Leaves all radical, glabrous or ciliate, lanceolate, sinuated or pinnatifid, the large irregular teeth pointing downwards as in a dandelion leaf. Involucre very hispid, with dark brown hairs. Flowers yellow, sometimes streaked with red below. Pappus pure white, equalling the achene in length.

High, rocky pastures up to 9000 feet ; common. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps.

Leontodon autumnalis L. var. *alpina* Gaudin.

This is occasionally found as high as 8600 feet in the Western Alps of Savoy, etc., and must not be confused with either of the above species, nor with *Taraxacum alpinum* Hoppe, which occurs on the tops of several of the Cols in Savoy, Dauphiny, and Piedmont, at from 8000 to 9000 feet. *L. hispidus* L. sub-species *alpicola* Chen. is sometimes seen in the Western Alps up to 2745 metres (9000 feet), as on the Col de la Leisse.

CREPIS L.

Capitula small, usually numerous, panicled or corymbose, rarely solitary. Involucral bracts numerous, in several rows, with a few outer scales. Receptacle flat, naked. Flowers yellow, orange, or rarely purplish. Fruit striated. Pappus-hairs in many rows, simple. Branched herbs with few-leaved stems. A numerous genus.

Crepis aurea Cass. (Plate XXXIX.)

Scape 4–6 inches high, erect, simple, leafless except for a few leafy bracts, with a solitary terminal capitulum, or rarely divided into 2 or 3 branches, each ending in a capitulum ; pubescent and even glandular at the summit, glabrous below. Leaves glabrous, but towards the summit covered, like the involucre, with black, woolly, but not glandular hairs. Radical leaves in rosettes, up to 3 inches long, ovate-lanceolate, deeply dentate or pinnatifid, sessile, with base narrowed into a leaf-stalk, persistent. Stem-leaves very small, linear, entire, or altogether wanting. Style yellow, black when dry. Achenes with 20 furrows, narrowed into a beak towards apex. Pappus pure white. Flowers orange-red, darker on the under side.

Abundant in Alpine and subalpine pastures up to 9000 feet. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Apennines.

Crepis pygmæa L.

Stem simple or branched, almost prostrate. Leaves cordate or elliptic, sinuate, dentate, with distinctly winged leaf-stalk, which is also indented, felted, cottony, or almost glabrous. Capitula solitary. Flowers pale yellow. Involucre woolly, with lanceolate, acute bracts. Achenes brown, slightly shorter than the pappus. Leaves often purple underneath.

Dry, rocky places, and among debris in the high calcareous Alps, 6500–8200 feet; rare. July, August.

Distribution.—Tyrol, Switzerland, Western Alps, Northern Italy, Pyrenees.

Crepis jubata Koch.

The smallest species. Stem 1–2 inches high, hispid, and with 1 or 2 small leaves, and surmounted by a large, solitary capitulum. Radical leaves oblong-obovate, rounded or spathulate, or oblong-lanceolate, entire or slightly toothed, generally obtuse, glabrous or with a few hairs. Involucral bracts woolly, with long soft hairs. Flowers bright yellow. Pappus white.

Elevated and exposed rocky places and Cols from 6500–8800 feet; rare. July, August.

Distribution.—Tyrol (Fimberjoch, Brenner, etc.), Switzerland (in Grisons and Valais, very rarely), Savoy, on the Col de l'Iseran, and on a neighbouring Col, where discovered by the writer in 1907.

Crepis incarnata Tausch.

Scape 6–12 inches high, leafless, branched at the top into a corymbose umbel. Leaves all radical, soft, oblanceolate, obtuse, dentate, hairy. Bracts of the general involucre not awned on either side. Flowers flesh-coloured, pink, or rarely white.

Pastures and stony places up to 5600 feet; local. June, July.

Distribution.—Eastern Alps from Tyrol to Carinthia.

Hypochæris uniflora Vill. (Plate XXXVIII.)

Stem 6–18 inches high, erect, striated, scape-like, with 1 or 2 small leaves, covered with simple, rough hairs, swollen at the summit, and bearing a large solitary capitulum. Leaves mostly radical, lanceolate, dentate, hispid. Capitulum 2 inches in diameter. Flowers bright yellow or pale yellow. Involucral bracts blackish, hispid, the outer ovate, the inner lanceolate.

Common in Alpine pastures and meadows up to 6500 feet. July, August.

Distribution.—Carpathians, Riesengebirge, Eastern, Central, and Western Alps.

SCORZONERA L.

Capitula several or solitary. Involucral bracts in imbricate rows. Flowers yellow or pink. Fruit elongated, not beaked. Pappus-hairs feathery, interlacing. Leaves entire.

Scorzonera rosea Waldst. and Kit. (Plate XXXVIII.)

Root thick, cylindrical. Stem few-leaved, simple or branched, but mostly with 1 capitulum only. Leaves linear-lanceolate, or linear, flat. Flowers pink. Fruit sharply spined above.

Alpine and subalpine meadows and pastures. June, July. Rare.

Distribution.—Carpathians, Southern, Eastern, and Central Alps.

Scorzonera aristata Ramb.

Rootstock with a few scales. Stem about a foot high, leafless, erect, glabrous, but cottony at the top. Leaves radical, linear-lanceolate, long and narrow, 3–5 nerved. Capitulum solitary, large. Involucral bracts large, consisting of 1–3 exterior, elongated, subulate-aristate leaves, about equalling the interior ones. Pappus dirty white. Flowers yellow, twice the length of the involucre.

Alpine meadows and pastures; local; 5000–8200 feet. July.

Distribution.—Northern Italy, Tyrol to Carinthia, Eastern and Central Pyrenees.

Scorzonera hispanica L. is the cultivated Salsify (S. Europe).

MULGEDIUM Cass.

Capitula corymbose. Involucral bracts in several rows, few. Flowers blue. Fruit beaked, with a crest of bristles. Pappus-hairs soft, slender, silvery. Tall, robust herbs.

Mulgedium alpinum Lessing (*Sonchus alpinus* L.).

Stem 2–4 feet high, purplish, glandular-hairy at the top, branched and leafy. Inflorescence a dense corymb. Leaves glabrous, except on the dorsal nerve, lyrate-pinnatifid, the last segment broadly triangular and very large, amplexicaul, and acutely auricled. Involucral bracts in several rows, few. Flowers blue or light purplish blue. Fruit beaked, with a crest of bristles. Pappus-hairs soft, slender, silvery.

Damp, shady, bushy or rocky places, particularly in the Rhododendron and Alder zone. July.

Distribution.—Alps, Pyrenees, Jura, etc., Central and Northern Europe as far north as Scandinavia.

Mulgedium Plumieri DC.

Stem 2–5 feet high, erect, green, glabrous, branched near the top into a loose umbellate cyme. Leaves glabrous, like the whole plant, lyrate-pinnatifid, with very deep segments, amplexicaul, with broad, rounded auricles. Flowers blue, larger than in *alpinum*. Achenes greyish, elliptic, compressed, with 5 ribs on each face. Capitula few, shortly stalked.

Similar situations, but much less common than the last.

Distribution.—Western Switzerland, Vosges, Black Forest, Western Alps (of Savoy and Dauphiny), Cevennes, Pyrenees, Spain.

HIERACIUM L. (Hawkweed)

Herbs with perennial rootstock, entire or toothed leaves, and yellow or rarely orange-red flowers, either on leafless, radical peduncles or in terminal corymbs or panicles on leafy stems. Involucre more or less imbricated. Receptacle without scales. Achenes angular or striated, not narrowed at the top, with a pappus of simple, generally stiff hairs, of a tawny-white or brownish colour.

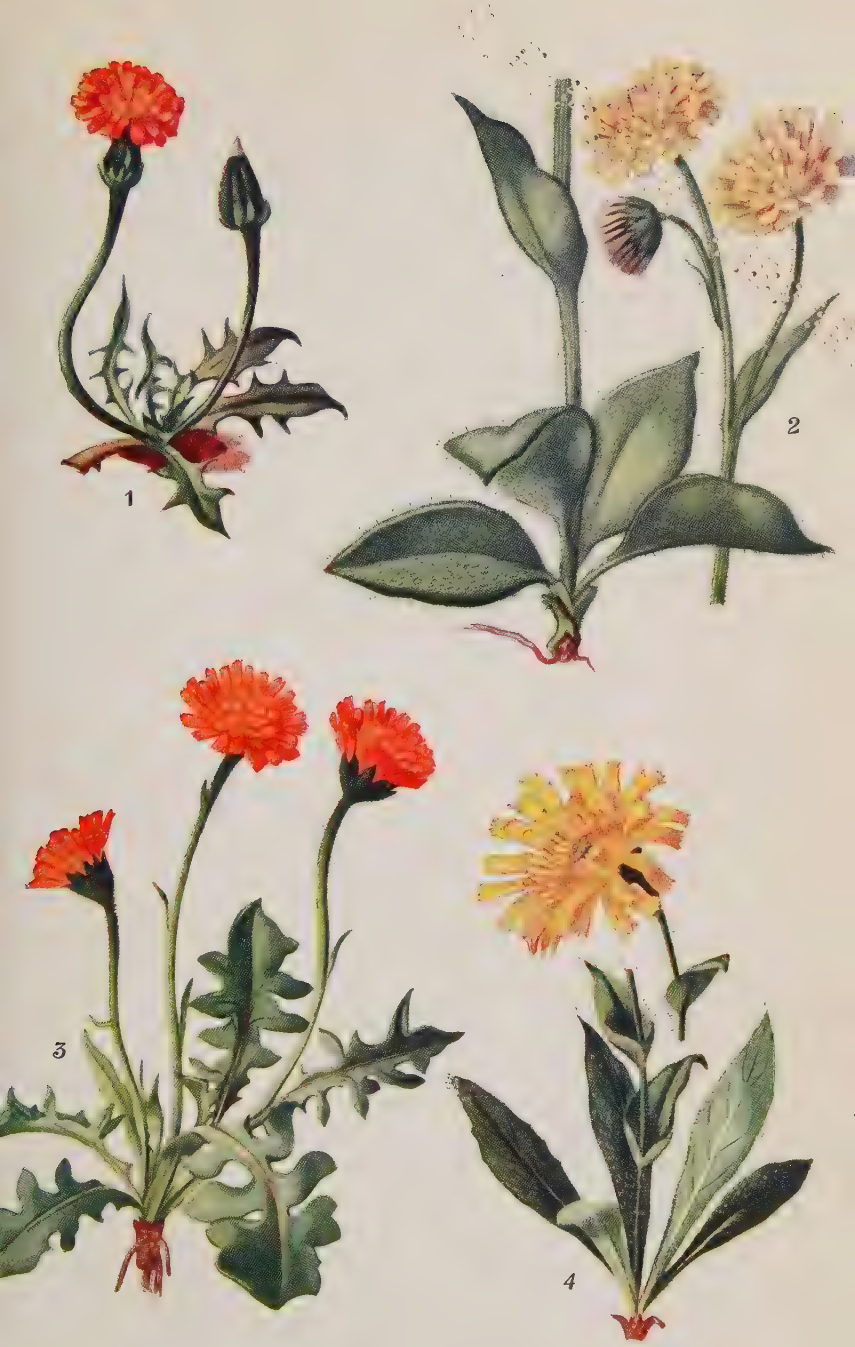

PLATE XXXIX.

1. Leontodon Taraxaci Lois.
2. Hieracium lanatum Vill.
3. Crepis aurea Cass.
4. Hieracium villosum Jacq.

A large European and North Asiatic genus, with a few American species, nearly allied to *Crepis*, but the achenes are not perceptibly contracted at the top, and the hairs of the pappus are usually stiffer and never so white. The habit is also different. Many species are very variable and difficult to classify.

Sub-genus Pilosella Fries.

Hieracium aurantiacum L. (Plate XXXVIII.)

Rootstock with creeping, underground stolons and putting up barren tufts of leaves as well as flower-stems. Stem erect, scape-like, very rough, with stellate and long, simple hairs bearing from 1 to 3 leaves on the lower part, and terminating in from 2 to many capitula arranged in a dense umbel, rarely only 1 capitulum. Leaves grass-green, ovate or linear-lanceolate, entire, acute or obtuse, sessile or narrowed into a foot-stalk, more or less rough, with long, simple but not stellate hairs. Stalk of capitula and involucres densely covered with stellate hairs, black glandular bristles, and long black hairs. Flowers a beautiful orange-red, sometimes almost crimson.

Rough Alpine pastures and steep, bushy places up to 7200 feet. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Erzgebirge, Black Forest, Vosges, Jura, Northern Europe as far as Norway. Sometimes naturalised in Britain, and frequently seen in cottage gardens. It seeds very freely.

Hieracium glaciale Lachenal.

Rootstock without stolons, but with rosettes of leaves. Stem floccose or with a few stiff hairs, often with 1 lanceolate leaf, glandular in upper part. Leaves lanceolate, acute, lengthening into a foot-stalk below, stellately hairy beneath. Flowers golden yellow. Capitula 3–7 in a small umbellate corymb. Involucre covered with dark, long wool and with a few glands.

High Alpine pastures and stony places, 6500–8200 feet; local. July, August.

Distribution.—Eastern, Central, and Western Alps.

Sub-genus Stenotheca Fries.

Hieracium staticifolium Vill.

Glaucous and glabrous, or sometimes somewhat hairy. Stem simple or slightly branched, usually leafless, with a few bracts at the top. Leaves radical, linear-lanceolate or linear, entire or slightly toothed, attenuated into a foot-stalk, glabrous and glaucous. Capitula 1–3, but usually solitary, large. Flowers pale yellow, turning green on being dried. Involucre bracts mealy, linear, acute.

Moraines and sandy river beds and high, stony pastures up to 8000 feet. June to September.

Distribution.—Eastern, Central, and Western Alps, Jura, Provence.

Sub-genus EUHIERACIUM Torr. et Gray

Hieracium glaucum All. (*H. porrifolium* Vill. non L.).

Closely resembling the last, with which it has sometimes been confused. Glabrous and glaucous. Stem erect, 10–18 inches high, leafy, loosely paniculate. Stalk of capitula with small scaly bracts above, and like the involucre nearly glabrous, or greyish with a fine mealy down. Involucral bracts obtuse, adpressed. Leaves rather thick, very narrow, bluish green, linear-lanceolate, sessile, entire or slightly toothed. Flowers yellow. Capitula usually solitary.

Sandy Alpine and subalpine valleys among debris and boulders, especially in river beds. July, August.

Distribution.—Eastern, Central, and Western Alps.

Hieracium Villosum Jacq. (Plate XXXIX.)

Densely villous, with shaggy hairs. Stem erect, with several leaves, simple or branching above, each bearing a large, handsome capitulum, like the involucre covered with stellate hairs as well as simple, long white hairs, usually dark at the base. Leaves bluish green, thin, acute or acuminate, entire or slightly dentate, villous or rough on both sides, or the lower leaves glabrescent. Root and lower stem-leaves lanceolate, elliptical, sessile or narrowed into a foot-stalk; upper stem-leaves ovate or ovate-lanceolate, sessile, with a rounded or heart-shaped, amplexicaul base. Limb of the ligulate flowers glabrous or slightly hairy or ciliated. Flowers bright yellow. Involucre bracts very acute and woolly. A variable species.

Rocks and rocky pastures of the calcareous Alps up to 8500 feet. July, August.

Distribution.—Carpathians; Eastern, Central, and Western Alps, Erzgebirge, Jura, Apennines.

Hieracium alpinum L.

Stem 3–8 inches high, erect, simple, and bearing 1 large capitulum, or rarely divided into 2 or 3 branches, covered with stellate hairs and woolly with simple hairs also, mixed in the upper part of the stem with stiff, black glandular hairs which more or less replace the woolly covering. Leaves grass-green, somewhat shiny, acuminate, wavy, entire or shallowly dentate, woolly or rough-haired, the uppermost having also stiff glandular hairs. Radical leaves oboval sub-spathulate or lanceolate. Involucre covered with glandular hairs, the exterior bracts being loose and spreading. Flowers large, yellow. Limb of the ligulate flowers ciliate, glabrous or with scattered hairs.

Alpine and subalpine pastures and rocks. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps, Vosges, Apennines, Central and Northern Europe. (British.)

Hieracium lanatum Vill. (Plate XXXIX.)

Stem erect, about a foot high, covered, like the whole plant, with a dense, short, grey-felted tomentum, branched above and bearing several large capitula. Root-leaves ovate, acuminate, entire or obscurely sinuate, stalked; stem-leaves sessile, lanceolate, acuminate, amplexicaul. Involucral bracts very woolly, lanceolate, acuminate, about as long as the fruit with the pappus. Flowers yellow.

Limestone rocks and cliffs; 3000–6500 feet; local. June to August.

Distribution.—Switzerland (in Valais), Western Alps from Haute-Savoie to the Var and Alpes-Maritimes; Piedmont, Apennines.

A very distinct plant, and well worth cultivating on limestone rocks and old walls in dry, sunny positions.

Hieracium intybaceum All.

Stem leafy, 6–12 inches high, covered with viscid, glandular hairs like the rest of the plant, simple or branched. Leaves narrowly lanceolate, with wavy or coarsely toothed margins, the lowermost narrowed at the base; upper leaves sessile or amplexicaul. Capitulum solitary or 1 to each branch. Flowers pale yellow.

Stony Alpine and subalpine places, descending to the forest region. July, August.

Distribution.—Eastern, Central, and Western Alps; Vosges.

Many other species, varieties, and hybrids of *Hieracium* are found in the Alps, but the above are among the more interesting and characteristic.

CAMPANULACEÆ

Leaves alternate, entire or toothed, without stipules. Flowers usually blue or white, either distinct or collected into heads with a general involucre. Calyx with a free border of 5 teeth or lobes, sometimes merely bristles. Corolla regular or irregular, with 5 lobes. Stamens 5, inserted at base of corolla. Anthers distinct, or rarely cohering in a ring round the style. Style single. Ovary and capsule inferior, divided into 2–5 cells.

A rather large family spread over temperate regions, and crossing the tropics in mountainous districts.

PHYTEUMA L.

Flowers in dense heads or spikes, surrounded by an involucre of bracts, usually blue. Corolla curved in bud, with 5 linear segments. Anthers free and distinct. Style cleft at the top into 2 or 3 stigmas. Capsule dehiscing below the middle, and crowned by the spreading teeth of the calyx.

A small genus spread over Europe and Western Asia, but chiefly in mountain districts.

Phyteuma comosum L. (Plate XL.)

Stem about 8 inches high, somewhat prostrate, leafy. Flowers on short stalks, forming a large terminal umbel, violet and handsome, the tip being darker than the rest of the corolla. Root-leaves reniform, bright green, sharply serrated like the petioled stem-leaves. Very distinct from all the other species.

Clefts of Alpine and subalpine rocks, 2300–5000 feet. May to July.

Distribution.—Carpathians, Tyrol, Carinthia, and Carniola.

Phyteuma Scheuchzeri All.

Stem simple, 1–1½ feet high, streaked. Leaves crenate, serrate, the lower ones long-stalked, lanceolate, acuminate, those of the barren shoots cordate, upper stem-leaves linear. Capitula globular, many-flowered, outermost bracts linear, usually longer than the capitulum. Flowers dark blue.

Stony Alpine and subalpine pastures, descending to a low elevation. May to July. 3000–7000 feet.

Distribution.—Eastern and Central Alps, including Southern Switzerland.

Phyteuma betonicæfolium Vill.

Very similar to the last in habit, but the capitula are at first ovoid and then cylindrical. Stigmas 3. Stamens glabrous.

Pastures on siliceous soil up to 8000 feet. July, August.

Distribution.—Southern Germany, Southern Austria, Central and Western Alps, Pyrenees, Spain.

Phyteuma Michelii All.

A taller species, with usually 1 erect, leafy stem, bearing a globular head growing cylindrical later. Leaves longly petioled, linear-lanceolate or lanceolate, slightly toothed. Bracts shorter than the blue flowers. Stigmas 2. Stamens and filaments ciliated.

Pastures of the siliceous mountains up to 6500 feet; local, and rare in Switzerland. July.

Distribution.—Eastern, Central, and Western Alps; Eastern Pyrenees, Spain, Southern Germany.

Phyteuma Halleri All.

The tallest and stoutest species. Stem 2–3 feet high, thick, hollow, leafy at the top. Radical leaves with very long petioles, broadly heart-shaped, and irregularly or coarsely toothed; upper leaves sessile. Flowers dark violet, in dense oblong-cylindric heads. Inferior bracts of involucre leafy, toothed, lanceolate, longer than the flowers. Stamens woolly. Stigmas 2.

Woods and pastures, 4300–6500 feet; local. July.

Distribution.—Carpathians, Servia, Eastern, Central, and Western Alps; Pyrenees, Spain.

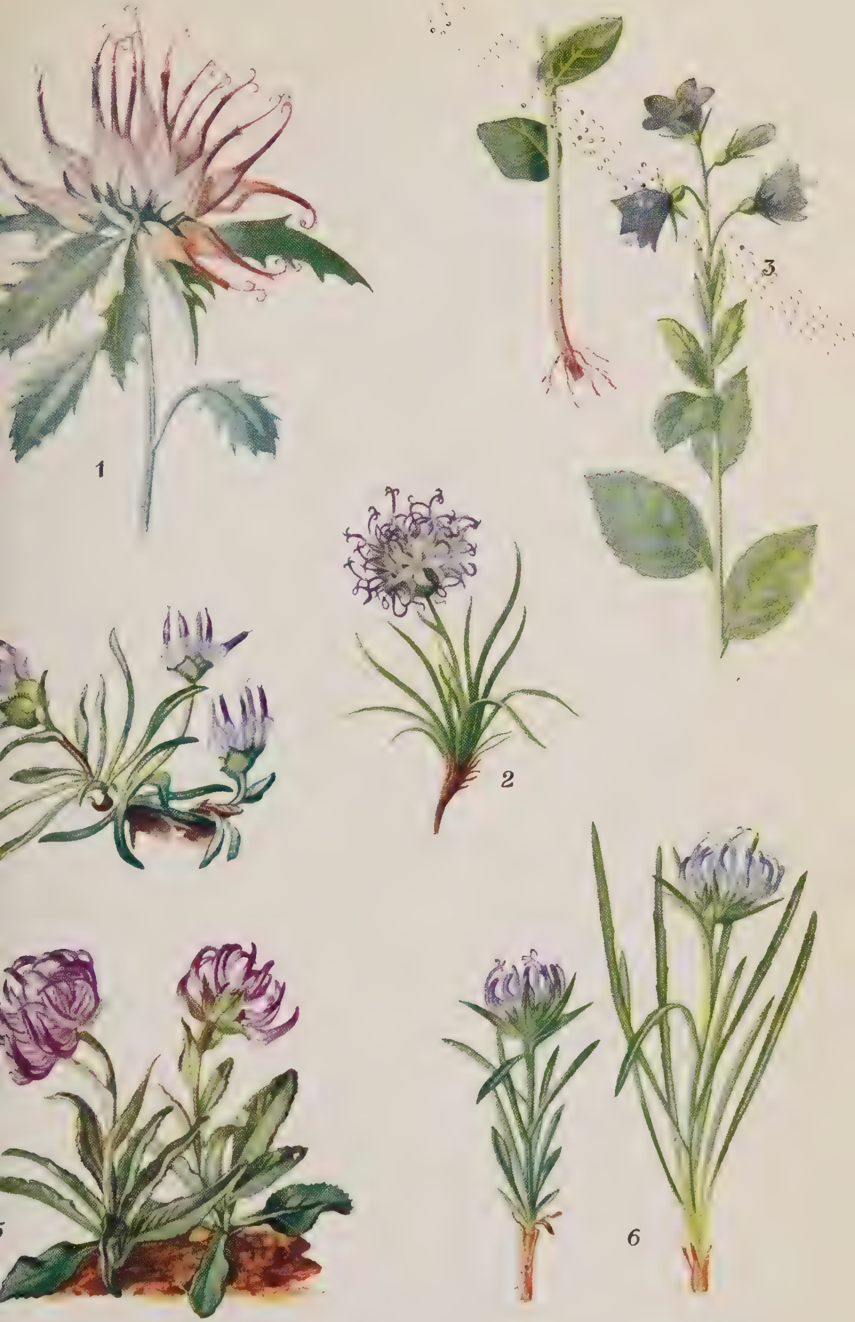

PLATE XL.

1. Phyteuma comosum L.
2. Phyteuma hemisphæricum L.
3. Campanula rhomboidalis L.
4. Phyteuma pauciflorum L.
5. Phyteuma Sieberi Spr.
6 Phyteuma humile Schleicher.

Phyteuma Balbisii A. de C.

Stem slender, flexuous, more or less prostrate, or ascending. Rootstock big and thick. Leaves cordate, acuminate, soft, petioled, with large, distant teeth. Flowers blue or white, in an ovoid and thin oblong spike. Bracts linear, ciliate, shorter than the flowers. Stigmas 3.

Cliffs in the French and Italian Maritime Alps, as e.g. in Val Casterino at about 5000 feet. August.

Endemic. Very difficult to cultivate even if procured.

Phyteuma pauciflorum L. (Plate XL.)

Stem 1–2 inches high, simple, with 1–3 leaves. Leaves lanceolate or obovate, entire or with 1 or 2 teeth at the apex, forming a loose rosette. Root tufted, thick, branched, and with several stems. Bracts of involucre ovate-orbicular, ciliate, shorter than the 5–8 flowered capitulum. Flowers blue, in globular heads. Stigmas 3. Stony places on high granitic or primary Alps, up to 9000 feet; local. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Pyrenees from Spain to Transylvania.

Phyteuma humile Schleicher. (Plate XL.)

Stem 2–3 inches high, leafy. Leaves linear. Bracts cordate-lanceolate, usually entire or with 1 or 2 strong teeth, as long as the spike, which usually consists of 12 flowers. Flowers bluish violet. Bracts of involucre nearly as long as the flowers, ovate at base, usually dentate. Inflorescence large and sub-globular. Calyx often coloured.

Primary rocks, 6500–8800 feet; very local. July, August.

Distribution.—Eastern and Central Alps; rare in Switzerland (Zermatt).

This species and *P. pauciflorum* are difficult to cultivate and require a stony or pebbly soil between two rocks, and well sheltered.

Phyteuma hemisphericum L. (Plate XL.)

From 2 to 3 inches high. Leaves linear, entire or slightly crenate at the base. Bracts of involucre half as long as the flowers, or rather longer, acuminate, finely hairy. Head of flowers nearly globular, 10–13 flowered. Flowers blue. Stigmas 3.

Pastures and turfy, rocky places, 6000–10,000 feet; especially on siliceous soil. July to September.

Distribution.—Eastern, Central, and Western Alps; Pyrenees from Spain to Transylvania.

Phyteuma confusum Kerner.

Is perhaps a variety of *P. hemisphericum* L. with shorter and broader spathulate leaves, which are usually ciliated at the base, otherwise glabrous. Bracts bluntly apiculate from a broad, ovate base, ciliated. Capitulum spherical, corolla dark blue, divided into narrow, linear petals.

It is stated to grow in meadows and on rocks in the Styrian and Carinthian Alps, on slate and gneiss.

Phyteuma Sieberi Spreng. (Plate XL.)

Stem 2–4 inches high, leafy, thick. Lower leaves on stalk lanceolate or cordate, crenate; upper leaves sessile. Bracts of involucre rhomboid or ovate, apiculate, coarsely dentate, outer ones decurrent on the stem. Capitula many-flowered (10–15), more or less globular, large. Flowers blue.

Stony places and pastures, especially on limestone, in the Alps up to 7000 feet; local. June, August.

Distribution.—Eastern Alps, i.e. from Tyrol to Carinthia.

In habit it resembles a dwarf *P. orbiculare*, and requires much the same treatment, though less dependent upon lime.

Phyteuma orbiculare L. (Round-headed Rampion).

Stem 6–18 inches high, erect, often hollow. Leaves lanceolate, with a truncate or cordate base, stalked, crenate-serrate; upper stem-leaves linear-lanceolate, sessile. Involucral bracts lanceolate, somewhat serrate. Flowers deepest blue, in globular heads. Stigmas 3. Very variable in size.

Alpine meadows and pastures, often extremely abundant, and especially on limestone. From the plains up to 8600 feet. June, July.

Distribution.—Central and Southern Europe. (British.)

Of easy culture on a limy soil.

CAMPANULA L.

Flowers in panicles, racemes, or spikes, or rarely solitary, and occasionally in short, leafy heads. Corolla regular, bell-shaped, broadly tubular or rotate, with 5 broad lanceolate lobes. Anthers distinct. Stigmas 2, 3, or 5. Capsule crowned by the lobes of the calyx and dehiscing laterally or at the top. A numerous genus, widely spread over the globe, chiefly in the northern hemisphere or in mountain ranges of the hotter regions.

Campanula Zoysii Wulf. (Plate XLI.)

Stems ascending, or more or less pendulous, numerous, filiform, 2–4 inches high. Leaves entire, radical leaves ovate, stalked; leaf-stalk as long as leaf; lower stem-leaves spathulate; upper stem-leaves linear-lanceolate. Flowers elongate-campanulate, narrower above, and somewhat contracted at the mouth, bearded within. Calyx-teeth subulate.

Rocks and clefts on the calcareous Alps, 6500–8600 feet. July, August.

Distribution.—Eastern Alps; rather rare and local.

A free bloomer and easy to grow in loam mixed with old mortar or other lime refuse.

Campanula rhomboidalis L. (Plate XL.)

Stem erect, leafy above, about a foot high, slender. Raceme more or less unilateral, 3–5 flowered. Leaves all sessile, ovate-lanceolate, dentate, glabrous or slightly hairy. Flowers blue, pendent. Calyx-teeth linear or subulate, two-thirds length of corolla.

Meadows and openings in woods in the Alps and lower Alps; June to August; very abundant and sometimes giving a blue lustre to the meadows.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Pyrenees, Spain.

Campanula pulla L. (Plate XLI.)

Stem erect or ascending, obtusely angled, glabrous or with a few scattered hairs like the leaves, leafy below, 1-flowered. Leaves crenate; root-leaves and lower stem-leaves ovate or elliptical, shortly stalked, longer than the leaf-stalk; median stem-leaves narrower, acute, sessile; uppermost lanceolate, small. Corolla terminal, bell-shaped, large, dark violet-blue. Calyx-teeth linear, one-third length of corolla.

Pastures, woods, bushy and stony places in the calcareous Alps, 4000–6500 feet.

Distribution.—Eastern Alps.

Easily grown in an open, sunny spot, but is apt to die off in winter.

Campanula excisa Schleicher.

Segments of corolla incised at the base, and separated by a rounded sinus. Calyx-teeth reflexed. Rootstock slender, rampant. Stem ascending. Leaves lanceolate or linear-lanceolate, occasionally toothed or with cilia. Flowers blue, 1–3.

Granitic Alps; local and rare; 6500–9000 feet.

Distribution.—Switzerland (Southern Tessin and Valais, above the Valley of Münster and between Saas and Binn). Aosta Valley in Piedmont.

Grows rapidly in gritty loam, but hates lime. Sometimes a little peat will improve the growth.

Campanula linifolia Scop. (*C. carnica* Schiede). (Plate XLI.)

Rootstock slender. Stem slender, mostly 1-flowered. Leaves of sterile shoots cordate-reniform, stalked; leaf-stalk longer than the leaf; stem-leaves linear-lanceolate, lower ones sometimes toothed, upper ones very narrow. Calyx-teeth linear-lanceolate, reflexed, about as long as corolla. Flowers blue. Sometimes regarded as a var. of *C. rotundifolia* (the Harebell), but differing chiefly in its reflexed calyx-teeth.

Clefts of rock above 5500 feet. June, July.

Distribution.—Carinthia; local.

Campanula rotundifolia L. (Harebell).

Occurs in the Alps up to 6500 feet.

Distribution.—Mountainous Europe, Asia, and North America. (British.)

Campanula pusilla Haenke. (Plate XLII.)

Cæspitose, with numerous tufts of leaves and slender flowering stems. Stems 2–4 inches high, leafy at base, bearing a slender raceme of 1–5 flowers, but more frequently the flowers are solitary. Leaves of barren shoots roundish, coarsely serrate, slightly cordate, much shorter than leaf-stalk, other leaves lanceolate or linear-lanceolate. Usually glabrous. Corolla pale blue, very rarely white, campanulate. Calyx-teeth linear, not one-third length of corolla.

Gravelly, moist places and shifting screes and banks of slaty detritus, especially fond of limestone, up to 9000 feet, but descending beds of streams to the plains; very common. June to September.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps, Vosges, Jura, Pyrenees.

C. pusilla is a very useful plant for the garden, and is grown in borders or rockeries, or even on old walls. It prefers a light, porous, and yet finely divided soil.

Campanula Scheucheri Vill.

Like a large and robust harebell, and resembling it in the rounded, heart-shaped root-leaves, which soon die down in both species. Stems ascending, 6–8 inches high. Stem-leaves linear-lanceolate, entire or toothed, sessile. Flowers blue, large, usually solitary, rarely 2–5 in a loose panicle. Buds pendent or nodding, and peduncles decumbent after flowering. Plant glabrous or rarely hairy. Calyx-segments linear-lanceolate, erect or spreading, one-third length of the corolla and twice as long as calyx-tube. Capsule drooping.

High pastures and stony, grassy places up to 9000 feet, and rarely descending below about 7000 feet; local.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees, Apennines, Sudetic Mountains, Arctic Russia.

Campanula cenisia L. (Plate XLI.)

Roots creeping and often penetrating long distances into sandy debris, like those of *C. pusilla*. Stems 1–2 inches high, 1-flowered, rather hairy. Root-leaves in small, dense, almost globular rosettes, small, glabrous, entire, ovate, acute, ciliated at the base, imbricate, lying flat on the ground; stem-leaves ovate-spathulate, small. Calyx covered with rough hairs. Lobes ovate-lanceolate, obtuse. Corolla deeply 5-cleft, funnel-shaped, electric-blue, sometimes

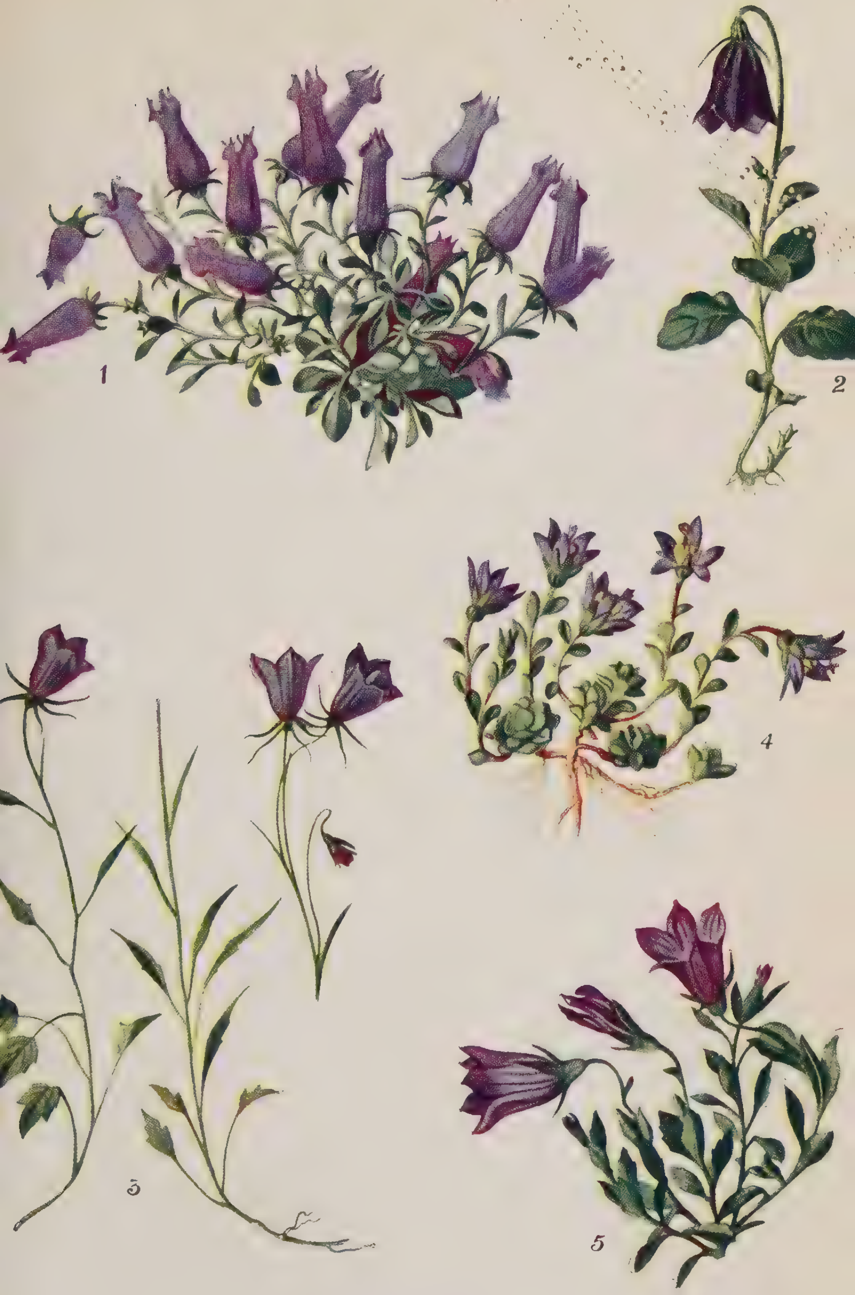

PLATE XLI.

1. Campanula Zoysii Wulf.
2. Campanula pulla L.
3. Campanula carnica Schiede.
4. Campanula cenisia L.
5. Campanula Morettiana Reichb.

almost the slaty-blue colour of the stones among which it grows. Style about as long as the corolla.

In glacier debris and moraines on limestone and schist; 6500–11,000 feet; local. July to September.

Distribution.—Tyrol, Switzerland, and Western Alps. On such heights as the Buet, Matterhorn and Hörnli, Mont Cenis, Col de l'Iseran, Aiguille du Goléon, etc.

C. cenisia is rarely seen below 8000 feet. Once near the Great St. Bernard road we found a specimen at only 6500 feet, which had probably been carried down by the stream from the neighbouring heights. In cultivation it requires a deep, gritty, sandy soil, with plenty of room for its long underground stems to penetrate.

Campanula Morettiana Reichb. (Plate XLI.)

Stems cæspitose, ascending, 1 but occasionally 2-flowered. Leaves more or less serrate, ciliate, those of the barren shoots cordate, stalked; stem-leaves ovate, narrowed into a short footstalk, the upper and lower leaves smaller. Flowers erect, campanulate, blue, 4 times as long as the lanceolate, hairy calyx-teeth.

Clefts of rocks and stony pastures in the higher Alps. June, July.

Distribution.—Southern Tyrol, Northern Italy; local.

Campanula Raineri Perpenti. (Plate XLII.)

Stem branched, hairy, ascending, 3–5 inches high. Leaves with rough hairs, ovate-lanceolate, distantly crenate, narrowed into the leaf-stalk. Corolla large, blue, funnel-shaped, expanded, erect. Calyx-teeth lanceolate, half as long as corolla. Filaments with a small ovate appendage at the base. Style shorter than corolla.

Rocky limestone pastures in Southern Tyrol at about 5500 feet; rare. July, August. Formerly on one mountain in Tessin.

It grows well in gritty loam, but is a favourite with slugs.

Campanula thyrsoidea L. (Plate XLII.)

Biennial. Root turnip-shaped, fleshy. Stem erect, 6–12 inches high, angular, leafy, covered with stiff hairs like the leaves, glandular-viscid at base. Leaves finely serrate or entire; root-leaves elongated, wedge-shaped, obtuse, prolonged into a leaf-stalk; stem-leaves linear-lanceolate, sessile. Flowers sessile, bell-shaped, 1–3 in axils of leaves, pale yellow, collected into a very dense, elongated spike. Calyx-teeth ovate-lanceolate. Capsule erect. Style long and prominent.

Pastures and steep declivities in the Alps up to 8000 feet. June, July. Local.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Provence, Croatia.

Must have a rich, deep soil and full sun. It dies after flowering, but generally seeds itself freely.

Campanula spicata L.

A biennial, 2–3 feet high, covered with grey hispid hairs. Stem erect, thick, leafy. Leaves close together, lanceolate, acute, crenate, sessile, getting shorter towards the long, spiky inflorescence. Flowers blue, in a dense, very long spike, erect, rather small for the plant. Lobes lanceolate. Calyx hispid, with linear lobes, about one-third length of corolla.

Pastures and hot, stony, bushy places in the Alps and lower Alps. July, August, up to 6500 feet; local.

Distribution.—Eastern, Central, and Western Alps as far south as Liguria (e.g. on Monte Toraggio), Sardinia.

Grows very easily in a limy loam, or on almost any poor soil.

Campanula alpina Jacq. (Plate XLII.)

Root thick and fleshy, many-headed. Stem 2–6 inches high, erect, furrowed, more or less villous like the whole plant. Leaves entire or serrulate, lowermost wedge-shaped, obtuse, narrowed into a foot-stalk; upper leaves linear-lanceolate, sessile, acute, often crowded. Flowers solitary in axils of leaves, on long, deflexed pedicels, sometimes numerous from the base to the apex, sometimes only on the upper half, rarely 1 single terminal flower. Calyx-teeth lanceolate; appendages of calyx much shorter than the teeth. Corolla broadly campanulate, with scattered long hairs in the throat, or nearly glabrous, azure-blue. Capsule pendent.

This beautiful and rare plant has the habit of the common *C. barbata.*

High Alpine pastures in the Carpathians and Eastern Alps from 5600 to 7000 feet. June to August.

Campanula barbata L. (Plate XLII.)

Root very long and tapering. Stem erect, obtusely angled, rough-haired like the whole plant. Leaves entire or slightly crenate, wavy, lowermost linear-lanceolate, narrowed into a foot-stalk; upper leaves lanceolate, obtuse, sessile. Flowers shortly stalked, in a single or compound raceme, usually unilateral, large and handsome, bell-shaped, porcelain-blue, occasionally darker. Ovary rarely white, bearded within and without. Calyx-teeth lanceolate, acute; appendages to calyx nearly as long as calyx-tube. Capsule nodding. Plant 10–18 inches high.

Alpine and subalpine meadows and pastures, 3000–8500 feet; widely spread. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Germany, Norway, Italy.

One of the most beautiful of the common Alpine plants, and it should be more frequently cultivated in England. It is more easily grown from seed than by getting the long tap-roots, and the only

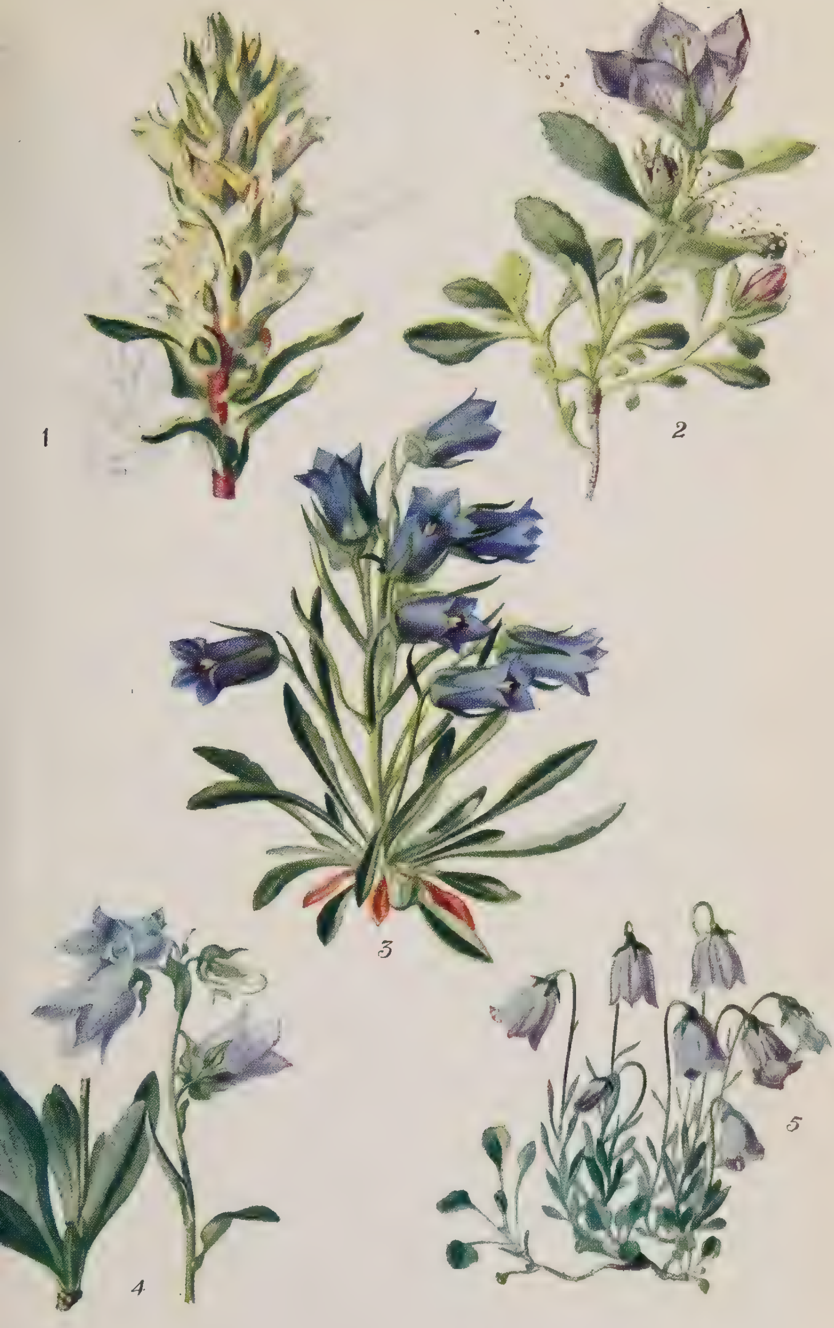

PLATE XLII.

1. Campanula thyrsoidea L.
2. Campanula Raineri Perpenti.
3. Campanula alpina Jacq.
4. Campanula barbata L.
5. Campanula pusilla Hænk.

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precaution to take is that it must not have too much wet in winter, or it is apt to damp off.

var. *strictopedunculata* Thomas.

This is a much-branched variety with lateral peduncles 15 or 20 cms. long, bearing 2 or 3 flowers on each branch. One specimen from Mont Cenis at 6500 feet had 4 branches, one with 3 flowers, and three with 2 flowers, besides 7 flowers at the summit of the principal stem.

The variety is not uncommon in Switzerland and the Western Alps.

Campanula Allioni Vill.

A small, prostrate species with a very large solitary flower. Stem often only 1 inch high, very leafy at the base, and pubescent like the leaves. Leaves oblong-lanceolate, narrowed below into a foot-stalk, entire or sinuate. Flowers blue, erect, solitary at the head of the stem and very large (3–4 cms.), and of a thin, delicate texture and with short, mucronate lobes. Calyx with 5 appendages one-third the length of the calyx-tube; calyx-lobes ovate-lanceolate, one-third length of corolla. Capsule drooping.

Rocky debris, moraines, and sandy beds of torrents in the primary Alps and on siliceous soil; rare; 6500–8200 feet. July, August.

Mr. Farrer has recently reported it growing at the base of cliffs in the Maritime Alps.

Distribution.—Alps of Savoy, Dauphiny, Provence, and Piedmont.

A difficult species to cultivate. It likes sun and plenty of moisture in the active season; dislikes lime, and is best grown on a moraine of grit and sand.

Campanula latifolia L.

This species, which grows in the west of England at about 400 feet elevation, reaches the subalpine region in many parts of Europe; but it cannot be called Alpine. It frequents damp mountain woods. The stems are 2–4 feet high, leafy, obtuse-angled. Leaves ovate-lanceolate, acuminate, coarsely biserrate, shortly stalked, pubescent. Calyx-teeth lanceolate. Flowers large, blue, deeply cleft into 5 lanceolate, acute lobes. July, August.

Mons. Correvon published an account of the Alpine Campanulas, chiefly from a cultural point of view, in *The Garden* from June to October, 1901.

VACCINIACEÆ

A rather small family allied to *Ericaceæ*, and represented in temperate and northern regions and in mountainous parts of the tropics.

Vaccinium L.

Small woody shrubs, often with shiny, evergreen leaves. Corolla regular, campanulate or rotate, 4–5 cleft. Stamens 8–10. Style filiform. Calyx 4–5 fid. Ovary 4–5 celled. Fruit a berry. Flowers solitary or in racemes.

Vaccinium Myrtillus L.

The Whortleberry or Bilberry is very common, especially (as in England) on the older rocks of the Alps; and in the Maritime Alps it reaches a height of 9000 feet, as on Monte Santa Maria. The fruit is frequently larger than in England, especially in the Chamonix Valley. In autumn, from the beginning of September, mountain-sides are sometimes ablaze with the crimson, autumnal tints of this plant.

Vaccinium uliginosum L.

Differs from the last by its entire, ovate, obtuse leaves, which have a prominent network of veins and are glaucous beneath; its smaller and more numerous flowers and berries which are not pleasant to the taste like the former.

It frequents damper places, but reaches a height of 9000 feet or 2745 metres in the Western Alps.

Vaccinium Vitis-idæa L.

The Cowberry is very common in Alpine woods and on rocky pastures, its waxy, flesh-coloured flowers and frequently crimson leaves (in late summer) making a pretty object.

It extends up to about 7200 feet.

Vaccinium Oxycoccos L.

The Cranberry, which grows in sphagnum bogs and marshes, is occasionally seen up to 5600 feet, but it is always difficult to find, and the delicate scarlet flowers are very fugitive. It grows near the lake at Champex in Switzerland.

ERICACEÆ

Herbs or woody shrubs, often evergreen. Flowers regular, campanulate, 4–5 lobed. Calyx 4–5 fid. Stamens 4–10. Ovary 4–5 celled. Style terminal. Fruit a berry or capsule.

A family of over 1000 species, spread over the whole globe, but particularly on siliceous soil.

Arctostaphylos alpina Spreng.

A small under-shrub, forming great masses or cushions on rocks and stones. Leaves often dry, serrulate, wedge-shaped or narrowly obovate, running into the leaf-stalk, ciliate at the base, otherwise glabrous, reticulately veined. The new leaves are not developed at time of flowering. Flowers 2–6, arranged in a raceme at the summit of the branches, small, greenish or reddish white. Drupe green, then red, and finally blue-black, not ripening till the second year.

Stony places on the calcareous Alps up to 8500 feet. May, June.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Pyrenees; high mountains of Europe; Arctic Europe and Asia; Rocky Mountains. (British.)

Arctostaphylos Urva ursi L.

Leaves coriaceous, evergreen, entire. Corolla reddish. Berry red. A small shrub 3–6 feet high.

Occurs preferably on limestone, up to 9000 feet in the Alps, Pyrenees, etc. On heaths in Scotland.

Distribution.—Mountains of Europe, Asia, and North America.

ERICA L. (Heath)

About 400 species, inhabiting Europe, the Mediterranean region, and South Africa.

Erica carnea L. (Plate XLIII.)

A shrubby, somewhat prostrate plant, with branches 3 inches to 1 foot long, erect or ascending, glabrous like the whole plant. Leaves 4 or more in a whorl, deciduous, acicular. Flowers in terminal, spicate, usually unilateral racemes. Petals tubular-urceolate. Stamens and styles projecting from the corolla. Calyx and corolla rose-coloured, rarely white, anthers purple-black.

Rocks, margins of woods, and in the woods themselves, up to 8500 feet, often covering large tracts; local, and almost always on limestone. April, May.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Central and Southern Europe.

Calluna vulgaris (L.) Hull.

The Ling occurs in Switzerland up to 8800 feet, but it is local, and prefers the siliceous rocks, as in the British Isles.

Azalea procumbens L. (*Loiseleuria procumbens* (L.) Desv.). (Plate XLIII.)

A procumbent, shrubby plant, the stem much divided into interwoven branches, and forming flat cushions. Leaves very small, shiny, oval or lanceolate, entire, obtuse, with revolute margin, rigid, evergreen, glabrous like the whole plant. Calyx and Capsule purple-brown. Flowers small, rose-coloured, collected into a 2–4 flowered inflorescence at the end of the branches. Contains an acrid narcotic substance.

High Alpine pastures and mountain tops, often covering large tracts with its cushion-like masses, 6000–9800 feet. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Central and Northern Europe, North America and Arctic regions. (British.)

Rather troublesome to cultivate, and often apt to get lost in the winter. It is best on a sloping bank in a south-east aspect, and on well-drained soil. A compost of peat, white sand, and leaf-mould may be used with some ordinary loam. All the fine should be sifted out before it is put into the place intended for the Azalea. Make it very firm, add a covering of white sand, and then give a good watering. A top-dressing of sand and fine peat in autumn and spring. (W. A. Clark.)

RHODODENDRON L.

Shrubs with alternate and often large leaves. Flowers large, handsome, and usually red, often irregular. Sepals and corolla lobes usually 5. Stamens usually 10.

About 200 species in Europe, Central Asia, Malay, and North America.

Rhododendron hirsutum L. (Plate XLIII.)

An erect, branched shrub. Leaves elliptical, ovate or obovate, obtuse, finely crenate, more or less strongly ciliated, otherwise glabrous, cartilaginous, evergreen, bright green above, shining, dotted on under side with scattered, resinous, at first yellowish, finally rusty-brown glands. Flowers in terminal corymbs, nodding on erect flower-stalks. Corolla funnel-shaped, dotted on the outside with resinous glands like the flower-stalk, calyx, and ovary. Flowers a beautiful rose-colour, rather paler than in *R. ferrugineum*.

The colour of the flowers and the myrtle-green of the leaves of this and the next species are among the most beautiful adornments of the Alps, immense districts being often clothed in summer with a rose-coloured carpet, the rocks themselves being often hidden with the same beautiful tapestry.

Rocky places and steep mountain sides in the limestone Alps and sub-Alps, extending up to 7200 feet, and descending very low occasionally, as e.g. at St. Margrethen in the Rhine Valley, and on the banks of Lake Maggiore. Though such a lime-lover it is not found in the Jura, and, strangely, *R. ferrugineum* is!

Distribution.—Carpathians; Eastern, Central, and Western Alps. But only in one of the French Alps. June to August.

Well-rooted plants can be grown in a sheltered, rather cool position, in a mixture of peat, limestone, and sand.

Rhododendron ferrugineum L. (Plate XLIII.)

A similar-sized shrub. Leaves lanceolate to elliptical, obtuse, entire, or sometimes finely crenate, glabrous above, somewhat revolute at the margin, coriaceous, evergreen, dark green and shining above, covered on the under side, when young, with densely packed yellowish, resinous, finally coalescent glands, turning rusty-brown when older. Flowers in terminal corymbs, more or less erect on the flower-stalks, which are longer than in *hirsuta*. Flowers funnel-shaped, dotted on the outside with resinous glands

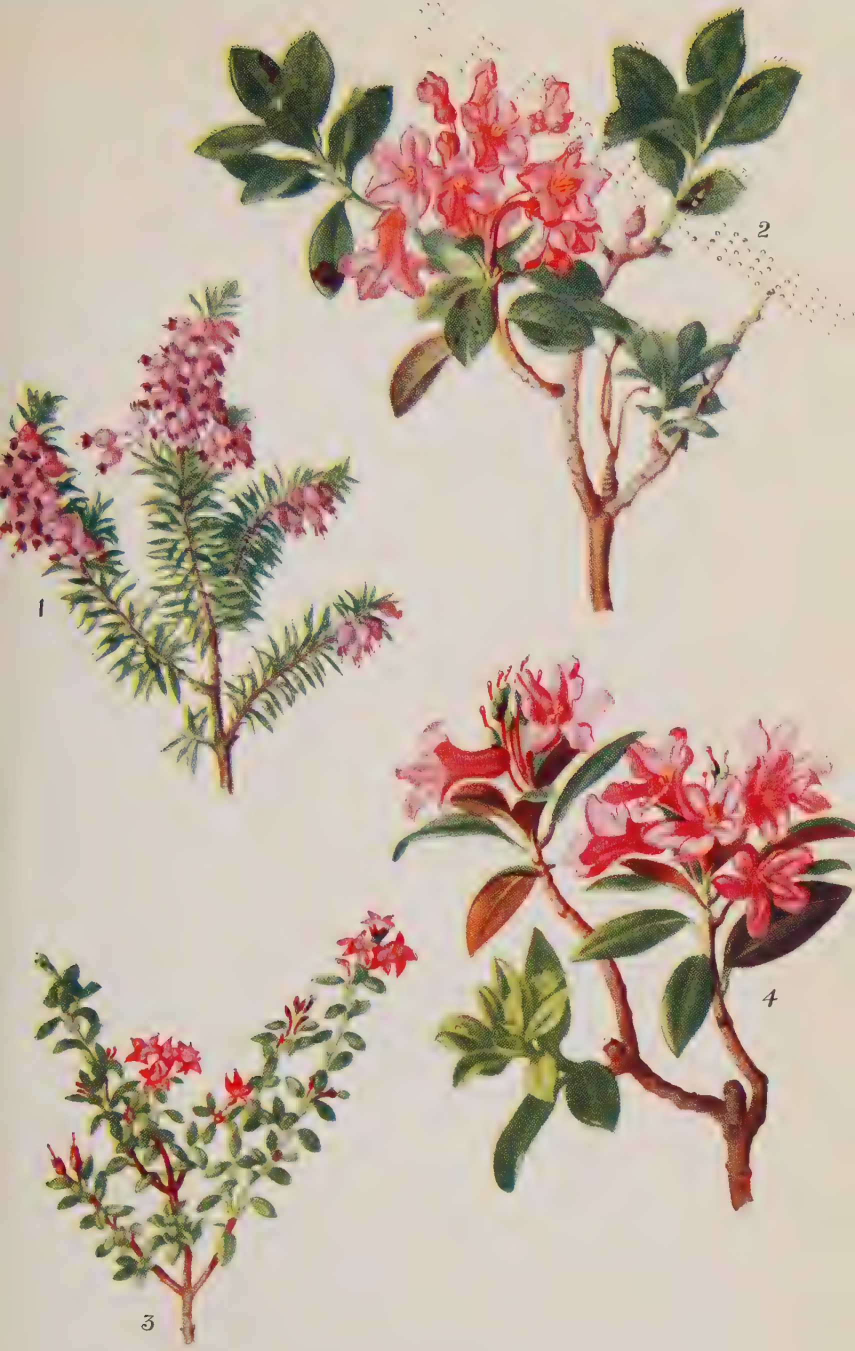

PLATE XLIII.

1. Erica carnea L.
2. Rhododendron hirsutum L.
3. Azalea procumbens L.
4. Rhododendron ferrugineum L

like the glabrous flower-stalk, calyx, and ovary. Leaves of the previous year cinnamon-brown in colour. Leaves more crowded than in *hirsutum*.

Similar habitats, but usually on primary rocks. June to August. It ascends to 8800 feet in Valais, to at least 8200 feet in the Maritime Alps, and descends into the plain in Tessin by Lago Maggiore (with *R. hirsutum*), and by Lake Wallenstadt, and it is occasionally found as a glacier relic in turbaries in woods of the Swiss plateau.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Pyrenees, Apennines, Spain, Transylvania.

Can be grown from well-established plants in a mixture of peat and sand, in a sheltered and somewhat cool position in the garden.

Rhododendron Chamæcistus L. (Plate XLIV.)

A small, prostrate under-shrub, not exceeding 6 inches in height, with ascending branches. Leaves very small, elliptic-lanceolate, more or less serrate, ciliated, otherwise glabrous, coriaceous, evergreen, grass-green on both sides, shining, not dotted, cilia often glandular. Flowers in clusters of 1–3, on long stalks, erect, rotate or expanding, rose-coloured, very deciduous. Calyx-teeth lanceolate, acute, reddish purple. Anthers purple-black.

Abundant, but local, in stony Alpine and subalpine places, on limestone, but not making such a feature in the landscape of the Eastern Alps as the other species, the flowers being paler, and the leaves appearing only after the flowers. May to July.

Distribution.—Carpathians, Eastern Alps from Tyrol to Carniola, 4000–5000 feet.

A partially shady place suits it best.

To succeed in the sun with it, the plant must be well established before planting out, or it must be shaded from the sun by artificial means; then it will bloom much more freely than in a shady place.

Hard peat and sand should be pressed firmly against the roots and it should be top-dressed twice a year with same compost. (W. A. Clark.)

PYROLA L.

Sometimes given a family to itself.

Very beautiful white or greenish flowers, in racemes or rarely solitary, nodding. Corolla globose or spreading, of 5 free or slightly connate petals. Sepals 5. Stamens 10. Style prominent. Ovary 5-celled. Leaves glabrous.

A small genus confined to the northern hemisphere of the Old and New World.

Pyrola uniflora L. (*Moneses grandiflora* Salisb.). (Plate XLIV.)

Stem 2–4 inches high, erect, 1-flowered, slender, leafless except at the base, and springing from a single slender root-fibre, which absorbs water and nutriment from the moss and decaying Pine-needles upon which it grows. Leaves ovate, roundish, suddenly narrowed into a foot-stalk, finely serrate, usually in loose rosettes. Corolla shallow, white, nodding. Stigma large, 5-lobed. Anthers orange.

Margins of moist woods in shady, mossy places, and frequently growing in a bed of Pine-needles ; 1500–5600 feet ; not frequent.

Distribution.—Erzgebirge, Eastern, Central, and Western Alps ; Vosges, Cevennes, Pyrenees, Corsica, Arctic Europe and Asia, North America. (British.)

Difficult to establish in gardens, and, indeed, difficult to procure except from seed, for the roots are so delicate and almost non-existent. It may succeed in damp moss and leaf-mould in a shady position under trees. The other Pyrolas can be grown in a mixture of sand, peat, and leaf-mould, preferably in a northerly aspect.

Pyrola rotundifolia L. (Plate XLIV.)

Stem erect, leafless except at the base, often reddish, with several red, scaly bracts near the summit. Leaves roundish or ovate, entire or obscurely crenate, dark green, shining and leathery. Raceme loose, many-flowered. Calyx-teeth lanceolate, acuminate, with apex recurved, half as long as the shallow, widely-open corolla. Stamens curved upwards. Style bent downwards, with the apex ascending, thickened above in a ring and there as wide as the stigma, projecting from the corolla. Flowers white. Anthers and style orange-red.

Shady Alpine and subalpine woods. June, July.

Distribution.—Eastern, Central, and Western Alps, Europe, Central and Northern Asia, North America. (British.)

P. chlorantha Sw., *P. media* Sw., *P. secunda* L. (with unilateral inflorescence and ovate-lanceolate leaves), and *P. minor* L. are also found in subalpine woods, *P. secunda* reaching a height of 6800 feet.

PRIMULACEÆ

Leaves undivided except when under water (as in *Hottonia*). Calyx usually 5-cleft. Corolla regular, 5-lobed. Stamens 5, inserted opposite the centre of the corolla lobes. Ovary 1-celled. Style and stigma undivided. Ovules numerous, with a free central placentation. Fruit a capsule dehiscing by valves or transversely.

A widely-spread family, many inhabiting mountain regions, often at a great elevation. A few appear in the Antarctic regions, and even within the tropics.

ANDROSACE L.

Small Alpine herbs, often with small rosettes or dense elongated tufts of leaves. Flowers white or pink (yellow in *A. Vitaliana*) in small umbels, within an involucre of bracts, or solitary in the axils

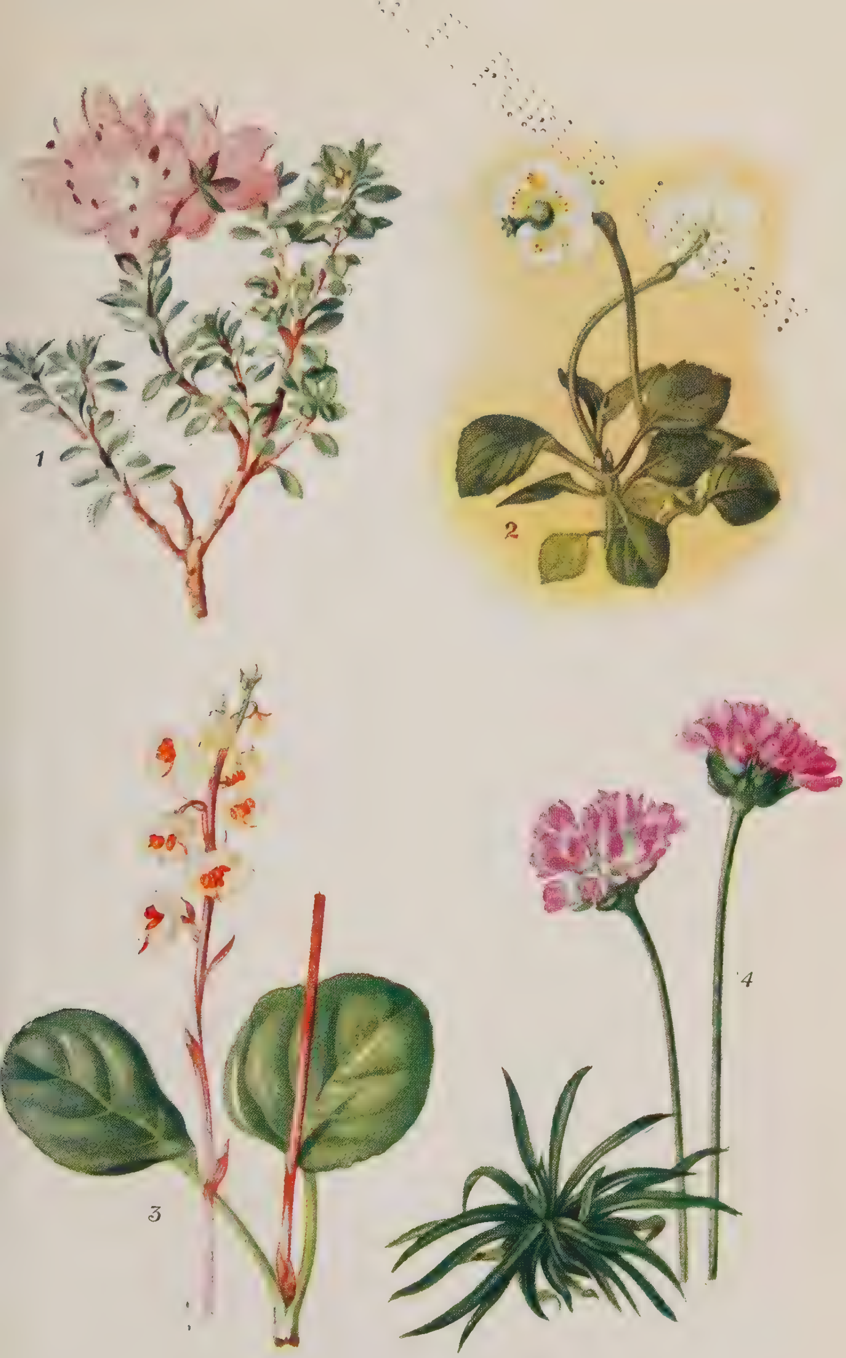

PLATE XLIV.

1. Rhododendron Chamæcistus L.
2. Pyrola uniflora L.
3. Pyrola rotundifolia L.
4. Armeria alpina L.

of the leaves. Corolla-limb rotate, tube long, suddenly contracted at the mouth, where there are 5 scales.

High mountain plants, chiefly distributed in Central Europe and Central Asia.

Androsace helvetica Gaudin. (Plate XLV.)

1–1½ inches high. Leaves densely imbricate and adpressed to the stem, lanceolate or spathulate, hairy. Stem forming branched tufts completely covered with leaves, and often with a terminal sessile flower on each branch. Flowers white, with yellow throat. Calyx lobes as long as the corolla-tube. Plant white-tomentose.

Clefts of rock in the higher calcareous Alps. July, August. 7800–10,000 feet.

Distribution.—Eastern, Central, and Western Alps.

Androsace imbricata Lam.

Similar in habit and size to the last. Leaves blunt, covered with a dense grey tomentum. Flowers solitary, usually briefly subsessile. Corolla white with red throat. Calyx with stellate hairs and obtuse lobes. Capsule equalling the calyx.

Rocks in the high primary Alps, 8300–10,000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Spain.

Androsace Wulfeniana Sieb. (Plate XLV.)

Stems not an inch high, cæspitose, and forming dense cushions not unlike those of *Silene acaulis* in colour and shape. Leaves densely crowded, lanceolate, acute, in rosettes at the apex of the branches, with scattered, adpressed, stellate hairs. Flowers solitary, shortly stalked, 4 lines in diameter, rose-red, rarely white, contracted at the throat, limb expanded.

On the highest ridges of the Alps, on slate; rare. July, August.

Distribution.—Eastern Alps (Salzburg, Carinthia, Fladnitz, Upper Styria).

Androsace pubescens DC.

Not an inch high, cæspitose. Leaves in dense rosettes at the ends of the branches, persistent on the old stems, and forming compact obconical tufts. Leaves lanceolate, acute, covered with simple and branched hairs. Flowers white with a yellow throat. Calyx-lobes acute, rather longer than the corolla tube.

Rocks in high limestone and schistose Alps; rare. July, August. At 3850 metres above the old cabin on the Matterhorn (Vaccari).

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Spain.

Androsace alpina (L.) Lam. (*A. glacialis* Hoppe).

About an inch high, and forming dense rosettes and much-branched tufts, grey-green, with short, stellate hairs. Leaves lanceolate or oblong-lanceolate, more or less acuminate. Flowers shortly stalked, the stalk being as long as the small leaves. Flowers white, or pale rose-coloured with a yellow throat, solitary. Calyx-lobes pubescent, triangular, acute. Capsule scarcely as long as the calyx.

Rocks, moraines, and damp, shifting gravel on stony declivities in the high Alps, from 7800–13,700 feet, on siliceous and schistose formations. Found on the Matterhorn at 4200 metres, only 300 metres below the summit! Frequent. July to September.

Distribution.—Eastern, Central, and Western Alps.

Perhaps no plant is *so frequently* found at extremely high elevations in the Alps as this.

Androsace Charpentieri Heer.

A very rare species, only found in Tessin, and possibly in Valais. Corolla pink, on flower-stalks twice as long as the leaves, which are elliptic and sub-obtuse, and covered with simple and stellate hairs. It forms dense tufts and terminal rosettes.

Androsace carnea L. (Plate XLV.)

Cæspitose and tufted, though less so than most of the above species. Scape greyish white, from short stellate, flocculent hairs. Rosettes of leaves borne on branches of the roots. Leaves linear, acuminate, green, ciliate at the margin, with short bristles, sometimes somewhat hairy on the upper surface. Involucral bracts ovate, acute, shorter than the flower-stalks. Flowers 3–6, rose or pink, with a yellow throat partly closed.

Grassy and stony places on high siliceous Alps, 7300–10,000 feet; frequent. July, August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Vosges (Ballon de Soultz), Auvergne, Spain.

Androsace villosa L. (Plate XLVI.)

Root creeping, many-headed. Rosettes of leaves distant, nearly globular, dense. Scape 2–4 inches high; 3–6 flowers in an umbel, surrounded by an involucre. Plant covered with long, inconspicuously jointed hairs. Leaves lanceolate, narrowed at the base. Corolla white, turning reddish, with a yellow ring at the throat. Flower-stalk as long as the involucre.

In clefts of rocks and grassy places on high limestone mountains; very local. July, August.

Distribution.—Carpathians; Eastern, Central, and Western Alps, Jura (Dôle, etc.), Pyrenees; Northern and Central Asia.

Not in Switzerland, except on the Dôle, which is within Swiss territory.

Androsace obtusifolia All. (Plate XLVI.)

Root tapering, tufted, and with shoots which end in rosettes.

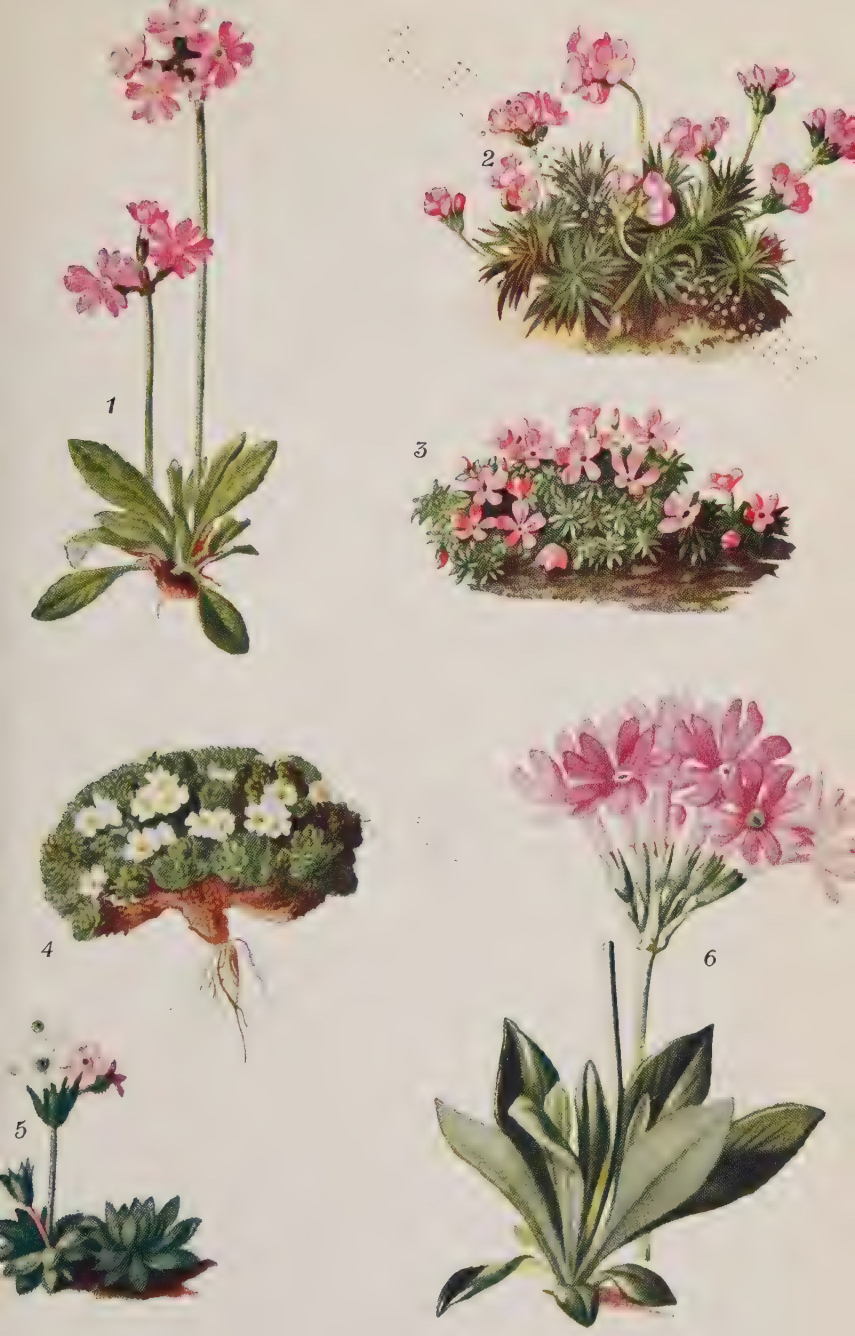

PLATE XLV.

1. Primula farinosa L.
2. Androsace carnea L.
3. Androsace Wulfeniana Sieber.
4. Androsace helvetica Gaud.
5. Androsace Chamaejasme Host.
6. Primula longiflora All.

[illegible]

Scape 2–3 inches high. Leaves oblanceolate, obtuse, finely ciliated, otherwise glabrous. Stem, involucre, and calyx covered with a short pubescence of simple and stellate hairs. Involucral bracts lanceolate, about equalling the flower-stalks. Umbels 2–6 flowered. Corolla white, with a yellow throat.

Grassy and stony pastures in the high Alps, especially on limestone; 6000–10,000 feet. July, August. Less common than *A. Chamæjasme* in Switzerland.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps, Transylvania.

Androsace Chamæjasme Host. (Plate XLV.)

Root tapering, tufted, putting up shoots ending in rosettes. Scape 2–4 inches high. Leaves oblanceolate or elliptical, villous at the margin, with long, simple hairs like the rest of the plant. Flowers in umbels surrounded by an involucre. Involucral bracts lanceolate or linear-lanceolate, rather shorter than or equalling the flower-stalks. Corolla white or rose-coloured; throat yellow.

Alpine pastures and stony places on calcareous and schistose Alps; 5500–9000 feet. June to August.

Distribution.—Carpathians, Erzgebirge, Eastern and Central Alps. Not in the Western Alps except very rarely in Savoy. Arctic Russia, Asia, and North America.

Androsace lactea L. (Plate XLVI.)

Scape glabrous, 2–4 inches high, springing from a large rosette of green linear or linear-lanceolate, acute leaves, which are glabrous and only ciliated towards the apex. Involucral bracts very small, linear-lanceolate, much shorter than the flower-stalks. Flowers sometimes solitary, and then without an involucre, white, with a golden-yellow disc at the throat. Lobes cordate. Flowers single or 3–5 in a loose umbel.

Alpine pastures and stony places on limestone; 5500–8000 feet. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps Haut-Jura. Rare in Switzerland, except in the Stockhorn Range and Alps of Fribourg.

Androsace septentrionalis L.

An annual species resembling the last, but taller and with smaller flowers in a more numerous-flowered umbel, and oblong-lanceolate, *toothed* leaves.

Grassy places and fields in the mountains up to 6500 feet; local. June, July.

Distribution.—Eastern, Central, and Western Alps, Northern Europe, Caucasus, Siberia, North America. Rare in Switzerland, and only in Grisons and Valais (Saas Thal, etc.).

A. Haussmanni Leyb. is found on dolomitic limestone in Tyrol and elsewhere in the Eastern Alps up to 8700 feet.

A. pyrenaica Lamk., *A. cylindrica* DC., and *A. ciliata* DC., are Pyrenean species peculiar to those mountains.

Aretia Vitaliana L. { *Androsace Vitaliana* Nees.
Gregoria Vitaliana Duby.
Douglasia Vitaliana (L.) Hooker. } (Plate XLVII.)

The only European species with bright lemon-yellow flowers. Root creeping, prostrate, forming loose tufts. Stems numerous, cæspitose, bearing a rosette of leaves at the extremity. Leaves linear or linear-lanceolate, covered with very short, branched hairs. Flowers axillary, sessile, 1–2 on each branch, lemon-yellow, turning green when dry, saucer-shaped, with a long, pale tube. Calyx shorter than tube of corolla. Capsule ovoid, blunt, shorter than the calyx, green.

High pastures and stony places, especially on schist; 7000–9300 feet; local, but sometimes abundant, as at Mont Cenis, above Saas, the Staffel Alp above Zermatt, etc.

Distribution.—Central and Western Alps from Tyrol through Switzerland and down through the Western Alps to the Italian Maritime Alps, and from Spain and the Pyrenees to the Venetian Alps. In Switzerland only in Tessin, Grisons, and Valais, and always local.

Some of the Androsaces are easy to grow, others are very difficult; but they all require a deep root-run in well-drained, gritty soil, and many of them are better in a south-west aspect, sheltered from the heat of the noonday sun. This particularly applies to such as *A. carnea*, *A. Wulfeniana*, *A. Vitaliana*, and *A. villosa*. They are best planted on a flat part of the rockery where the soil cannot be easily washed away from the roots. A top-dressing of sand or sand and grit is always beneficial, and the early spring is the best time for this. Such species as *A. helvetica* and *A. pubescens* require to be tightly wedged between two bits of limestone, raised above the general level, and exposed to the sun. Such species as *A. imbricata* can be treated in the same way, but granite grit must be substituted for limestone (*A. pubescens* will do on either rock). There must be sufficient space behind or below the plant in the crevice thus made for a plentiful supply of soil for the roots to penetrate into. In early summer the roots can have a good supply of water, but the plants themselves should be wetted as little as possible, or the leaves may turn brown and the young rosettes destroyed. *A. alpina* does best in deep, gritty sandstone mixed with fibrous loam. It must be protected from too much sun and from overhead damp, though in the spring its roots want plenty of water, for usually in nature they get this from the melting snows. *A. Chamæjasme*, *A. obtusifolia*, *A. lactea*, and others are more easily

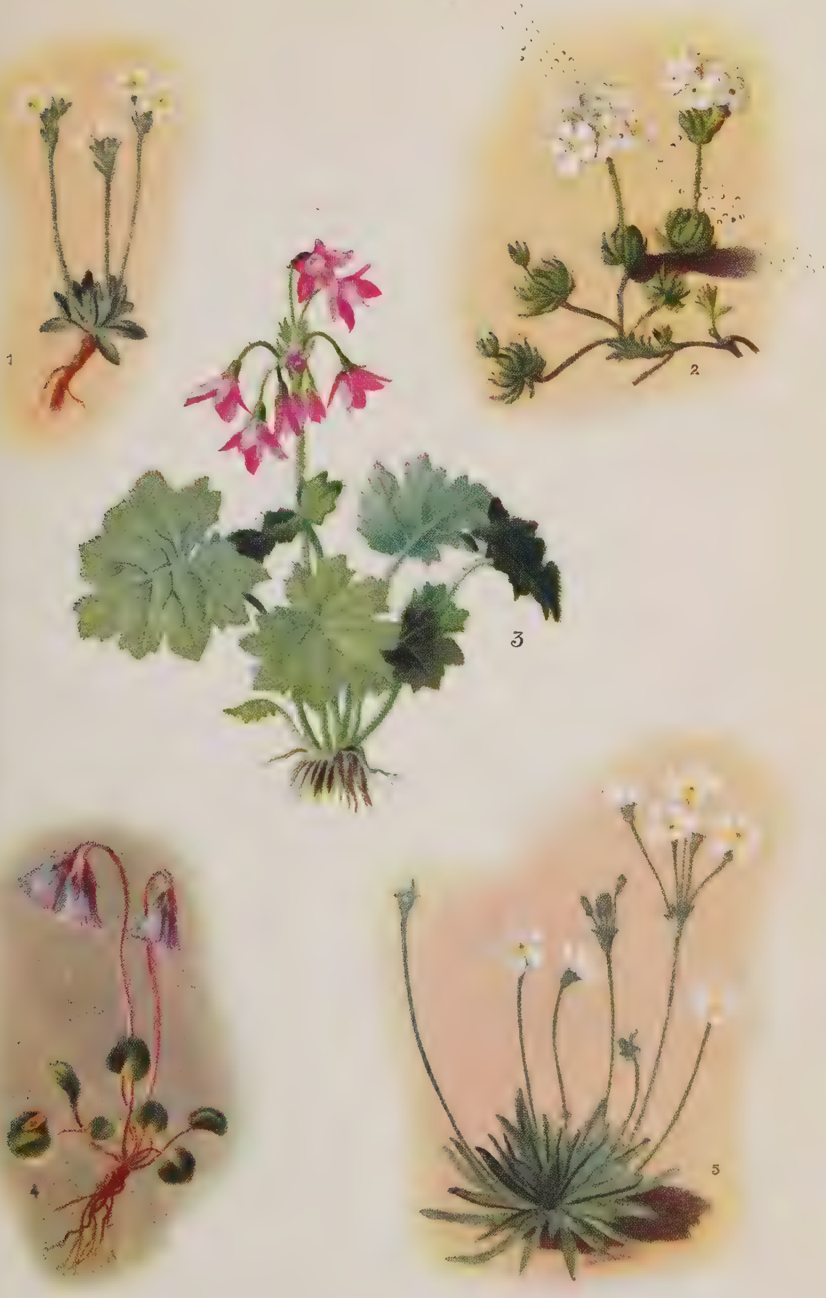

PLATE XLVI.

1. Androsace obtusifolia All.
2. Androsace villosa L.
3. Cortusa Matthioli L.
4. Soldanella pusilla Baumg.
5. Androsace lactea L.

cultivated in light, sandy soil mixed with pieces of grit or sandstone.

PRIMULA L.

Leaves radical. Flowers solitary or in a terminal umbel, on leafless, radical peduncles. Calyx tubular or campanulate, with 5 lobes. Corolla a tube, with an expanding 5-lobed limb, each lobe usually notched. Capsule opening at the top in 5 teeth. Seeds numerous.

A genus widely spread in Europe and Central and Northern Asia, containing many Alpine species, one or two of which reappear in Antarctic America.

Primula farinosa L.[1] (Plate XLV.)

Stem 3–9 inches high, erect, leafless, mealy in the upper part like the flower-stalks and calyx. Leaves radical, obovate-lanceolate, narrowed into a foot-stalk, dentate or nearly entire, obtuse, glabrous on the upper side, white mealy beneath, rolled up when young. Flowers in a crowded terminal umbel. Involucral bracts linear-apiculate, serrate at the base. Calyx-teeth oval, acute. Capsule longer than calyx. Corolla rather small, darker or lighter pink, very rarely white, with a yellow eye.

Damp, grassy pastures and meadows from the plains to the Alpine region up to 8200 feet, often in great abundance on limestone. April to July.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps; Jura, Central Pyrenees, Northern and Central Europe, Central and Northern Asia. (British.)

Very easily cultivated from plants or seed in ordinary sandy loam, with plenty of water in spring. Seedlings and plants generally should not be kept too long in frames or greenhouses in spring, or they lose their character and get drawn out.

Primula longiflora All. (Plate XLV.)

Like the last, but bigger in all its parts, with more pointed lanceolate leaves and larger flowers, with a long corolla-tube. Stem erect, mealy, 4–9 inches high, bearing a handsome 2–6 flowered umbel. Leaves ovate-lanceolate, crenate, glabrous, mealy beneath. Flowers large, with a long tube, 3 times as long as the calyx, duller pink than in *farinosa*, i.e. with more purple in the 'rose.' Calyx-teeth linear-lanceolate, mealy, not spreading.

Higher Alpine pastures, on primary rocks at about 6500 feet; rather rare. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Bosnia, Montenegro.

Primula Auricula L. (Plate XLVII.)

Leaves all radical, obovate or lanceolate, narrowed towards the base, obtuse, entire or with a wavy or toothed margin, coriaceous, glaucous on upper side, downy beneath and on margin with fine glands, when young more or less mealy and rolled up. Stem erect, leafless, glabrous or covered with a white powder or mealy, with fine glands like the flower-stalks and calyx. Flowers in a terminal 2–8 flowered umbel, stalked, yellow, fragrant, mealy towards the throat, 8–10 lines in diameter. Involucral bracts oval, obtuse. Calyx shortly campanulate, with short, oval, obtuse teeth.

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[1] *Primula scotica Hook. is not known on the Continent.*

Limestone cliffs and perpendicular rocks up to 7000 feet, and on rocky pastures at lower elevations in the subalpine district and Jura. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Black Forest; Servia, Apennines.

Primula ciliata Moretti (*P. Balbisii* Lehm.). Considered by some a var. of *P. Auricula.*

Leaves obovate, entire or serrate, with cartilaginous margin, strongly ciliated, and covered with short glandular hairs; when young, mealy like the flower-stalk and calyx. Flowers handsome, as in the last, but paler yellow, with white, mealy throat and scentless (?). Matured calyx usually not mealy.

Alpine and subalpine rocks; very local. May, June.

Distribution.—Eastern and Central Alps, Mont Baldo, Vallarsa, etc. Not in Switzerland.

These two plants should be wedged in between two limestone rocks in a vertical position in partial shade. A good, stiff loam is best.

Primula marginata Curt. (Plate XLVII.)

Stem 2–6 inches high, fleshy, bearing a few-flowered umbel of rather larger rose-purple flowers. Leaves smooth, thick, oval-elliptical, narrowed into a foot-stalk, cartilaginous, serrate, the margin mealy and white. Involucral bracts short and oval or nearly orbicular. Petals obcordate. Calyx mealy, with rounded tube and short oval bracts. Capsule sub-globular. A somewhat variable plant, according to position, etc.

Rocky places (limestone) in the Western Alps of Dauphiny and Provence, Liguria, and Piedmont; very local. June, July.

We have seen this species as low as 800 metres, near San Dalmazzo di Tenda in the Maritime Alps, and up to 2745 metres, or 9000 feet on Monte Santa Maria in the same district, and at Mont Cenis at 2590 metres or 8500 feet.

Primula carniolica Jacq.

Scape 3–8 inches high. Leaves elliptical or obovate, narrowed into a long leaf-stalk, entire or slightly crenate, glabrous like the whole plant. Involucral bracts very small. Flowers purple, fragrant, rather large, lobes obcordate, spread out nearly at right angles, flowers at first erect. Calyx campanulate, about one-third

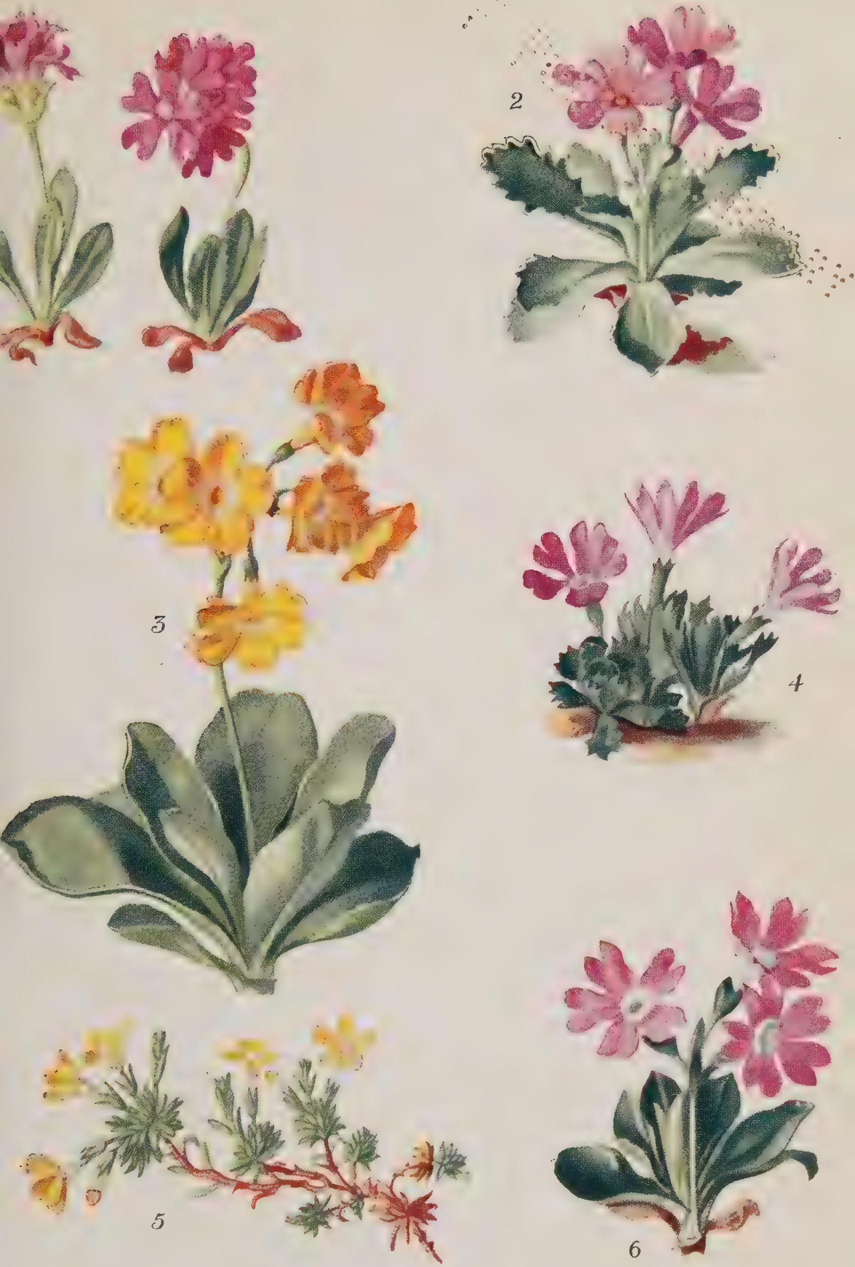

PLATE XLVII.

1. Primula glutinosa Wulf.
2. Primula marginata Curt.
3. Primula Auricula L.
4. Primula minima L.
5. Aretia Vitaliana L.
6. Primula spectabilis Tratt.

[illegible]

as long as corolla-tube, coloured after blossoming, teeth triangular, acute.

Alpine and subalpine pastures at about 5000 feet; rare. April to June.

Distribution.—South-eastern and Central Alps.

Primula calycina Duby.

Scape 6–8 inches high, glabrous, 3–5 flowered. Involucral bracts linear, acute, longer than the flower-stalks. Leaves lanceolate or elliptic-lanceolate, entire, glabrous, grass-green, with cartilaginous margin. Calyx tubular-campanulate, as long as or longer than the corolla-tube. Flowers red.

Alps and lower Alps; local. April, May.

Distribution.—South-eastern and Central Alps (not in Switzerland).

Primula integrifolia L.

Plant 1–2 inches high, springing from a creeping rhizome and forming large mats. Leaves shortly lanceolate, entire, glabrous, but somewhat pubescent or ciliate at the margin, not viscous. Stem 1–2 flowered, often glandular like the calyx. Calyx-lobes oval, obtuse. Involucral bracts linear, reaching to the middle of the calyx. Flowers large, rose-purple, or sometimes lilac. Lobes deeply emarginate, and corolla-tube twice the length of calyx. Capsule half length of calyx.

Wet rocks, limestone or schist, and moist elevated pastures, 6000–7500 feet. July (in Switzerland), earlier in the Pyrenees; locally abundant.

Distribution.—Switzerland (extremely abundant between the Trübsee and the Joch Pass), Piedmont, Pyrenees, Tyrol (rare).

Primula Allionii Lois.

Somewhat like the last in habit, but pubescent, viscous, and greyish green in colour. Plant about 2 inches high, from a creeping root. Scape almost wanting or much shorter than the leaves, bearing a solitary bright rose flower. Leaves oboval, lengthened into a long foot-stalk, entire or crenate, velvety and very viscous. Calyx viscous, with oval, obtuse teeth. Corolla-tube twice as long as calyx. Capsule globular, shorter than calyx.

Rocks in the subalpine region of the French and Italian Maritime Alps. (Endemic.)

Primula pedemontana Thomas.

A pubescent-glandular species 2–6 inches high. Leaves bright green, oboval or oblong, entire or crenate, finely pubescent, not viscous, edged with red glands. Flowers purple-violet, in umbels of 1–10, on pedicels longer than the short, oval bracts of the involucre. Calyx glandular, with oval, obtuse lobes. Corolla-tube twice length of calyx. Capsule rather shorter than the calyx.

High pastures in Savoy, Hautes-Alpes, and Piedmont; very local. June.

Primula glutinosa Wulf. (Plate XLVII.)

Glabrous, covered with a viscid secretion. Scape 2–4 inches high. Rootstock vertical. Leaves oblong-lanceolate or lanceolate, serrate in upper part, and lengthened into a foot-stalk. Involucral bracts ovate, obtuse, as long as the calyx. Umbel 3–6 flowered. Calyx nearly as long as corolla-tube. Flowers glandular at the throat, a beautiful violet. Corolla-lobes bifid.

High granitic Alps, chiefly in damp places, 6500–9000 feet. July, August.

Distribution.—Carpathians, Eastern and Central Alps, but only in Grisons (Engadine, etc.) in Switzerland.

Primula spectabilis Tratt. (Plate XLVII.)

Leaves lanceolate or elliptic-lanceolate, acute, entire, glabrous, with cartilaginous margin, very shortly ciliated, dotted on the upper side. Umbels 1–5 flowered. Involucral bracts linear, equalling the flower-stalks. Calyx tubular-campanulate, shorter than the corolla-tube.

Stony pastures and limestone rocks descending to the lower Alps. June to August.

Distribution.—Eastern Alps (Southern Tyrol and Carniola).

Primula minima L. (Plate XLVII.)

A very small plant about an inch high. Leaves in rosettes, wedge-shaped, truncate, coriaceous, and shining above, entire at the sides, deeply serrate at the apex, with finely acuminate teeth, glabrous or slightly downy, somewhat circinate when young. Stem very short or almost wanting, glabrous or like the calyx, glandular, rough, 1, rarely 2-flowered. Bracts 1–2, linear, acute. Calyx cylindrical, bell-shaped, more than half length of corolla-tube. Calyx-teeth obtuse. Segments of corolla spathulate, deeply divided, violet, with paler throat.

Pastures in the higher Alps, principally limestone, about 6500–7500 feet; very local. June, July.

Distribution.—Carpathians, Sudetic Mountains, Eastern and Central Alps, but not in Switzerland.

Primula commutata Schott. (Plate XLVIII.)

Scapes 3–6 inches high, numerous, soft. Leaves broadly spathulate, narrowed below into a foot-stalk, soft, glandular-hairy, almost truncate at the apex and coarsely dentate, somewhat thick, dirty green. Calyx-teeth broad, triangular. Anthers inserted above the middle of the corolla-tube. Flowers rose-red. Petals obcordate.

On porphyritic rocks, near the Castle of Herberstein, Styria. March, April.

Primula Tiroliensis Schott. (Plate XLVIII.)

Leaves on the lower parts of the stem imbricate, ending in a rosette about three-fourths the height of the stem, ovate; the upper ones broader, dentate, covered on both sides with glandular hairs; uppermost leaves small, scale-like. Scape 1–2 flowered, very short. Flower-stalks shorter than the scale-like bracts. Lobes of corolla bifid. Corolla bright rose-coloured. Leaves thick and succulent, with thickened cartilaginous teeth at the margin.

Southern Tyrol, on dolomitic limestone; rare. June.

Primula viscosa Vill. non All. (*P. villosa* Jacq., *P. hirsuta* All. non Vill.). (Plate XLVIII.)

A variable plant, whose nomenclature is rather involved. Stem 2–4 inches high, pubescent-glandular and viscid, like the leaves and calyx. Leaves roundish obovate, suddenly narrowed into a broad foot-stalk, crenate, dentate, very viscid. Flowers rose or rose-purple, fragrant, in umbels of 3–6, rather large, the tube being twice as long as the calyx. Pedicels longer than the oval involucral bracts. Calyx-teeth ovate, obtuse. Capsule shorter than calyx.

Shady, granitic rocks, and more rarely on limestone, banks and roots of larch trees, etc., and occasionally on stony pastures, 5000–8500 feet; common; descending sometimes to the plains, as e.g. at Vernayaz in the Rhône Valley and above Lake Maggiore. May to July.

Distribution.—Tyrol, Switzerland and Western Alps as far south as Provence; Pyrenees.

Primula latifolia Lapeyr. (*P. viscosa* All. non Vill., *P. hirsuta* Vill. non All.)

A stout plant, 6–8 inches high, on a long, robust, cylindrical rootstock, covered with the scales of old leaves. Leaves broadly lanceolate or oboval, narrowed below into a long stalk, the whole being 4–6 inches long, toothed or crenate, pubescent, viscous. Flowers a beautiful purple-violet, not red or pink, fragrant, in umbels of from 3–20, and with unequal pedicels, longer than the involucre, with oval bracts. Calyx-teeth oval, glandular. Corolla-tube 3 times length of calyx. Capsule longer than the calyx. Somewhat variable in size and in the shape of the leaves.

Rocks and cliffs in the high mountains and sub-Alps up to 2000 metres; rather rare. May to July.

Distribution.—In Switzerland only in Grisons (Engadine and near Poschiavo), Western Alps from Savoy to Provence; Pyrenees.

Primula elatior Jacq. (Oxlip).

Somewhat like the Cowslip, but with primrose or straw-coloured flowers, more erect than in the Cowslip and somewhat larger and longer leaves, less conspicuously veined and a duller green. Flowers not scented. Calyx-teeth triangular, acuminate, one-third the length of the calyx-tube.

Woods and pastures from the plains up to 7000 feet at least; common. It flowers from March to May in the plains, and continues till July in the higher mountains.

Distribution.—Europe, especially Western and Central; Taurus, Caucasus. In Britain in East Anglia only.

Much has been written about this plant in England by Mr. Miller Christy and others.

Primula intricata Gren. and Godr.

Whole plant pubescent and dull greyish green. Leaves lanceolate, elongated below into a long strap-shaped petiole, sparsely covered with short hairs on both sides, crenate and irregularly toothed, rolled in at the margin when young. Stem densely pubescent at summit, as are the pedicels and calyx. Calyx 12–14 mm. long, with sharply pointed triangular sepals, the ribs of the calyx darker in colour than the rest. Pedicels 6–10 mm. long. Corolla straw-coloured, turning green when dried, the size of *P. elatior* and with similarly incised lobes.

High Alpine pastures in the Maritime Alps (as at Fontanalba), 6000 feet, appearing in June just after the snow has melted.

Primula suaveolens Bertolini.

Is somewhat similar, but with a whitish tomentum underneath the leaves. Perhaps a variety of *P. officinalis* Jacq.

Alpine and subalpine pastures in the Maritime Alps, as at Fontanalba (6000 feet), and in limestone thickets at Montreux and various other places among the hills of the Var in Southern France.

Many of the Primulas which naturally grow on rocks, such as *P. Auricula* and *P. viscosa*, can be treated more or less in the same way by planting in deep crevices between rocks in plenty of good compost made of a mixture of peat, sand, and loam, or leaf-mould instead of peat. The roots should be tightly wedged between two pieces of limestone, sandstone, or granite, according to their natural preference; and Mr. W. A. Clark recommends the use of clay instead of loam to wedge the plants tightly between the stones; the clay will hold moisture for a long time, which the roots will take advantage of in the driest weather. Water, however, should be administered freely to the roots of many Primulas in the spring and early summer. Many species do better sheltered from the sun in a northerly aspect—*P. glutinosa, involucrata, calycina* in particular must not have too much sun. *P. integrifolia* will grow on a flat, exposed part of the rockery if the soil is moist and yet firm and well drained. It can have abundance of water in the spring. *P. minima* is so small it should be associated in the garden only with other choice and very dwarf plants. It likes a bare, open spot, with sandy peat and not a trace of lime. But it must not be allowed to become very dry. The same remark applies to *P. Allionii*, though wetting the foliage should be avoided as much as possible. To prevent an excess of rain falling on the leaves of this plant, Clark recommends the placing of a large stone to hang over the Primula, say a foot above the plant, sloping in towards the bank, so that rain may run off direct from there to the roots in a sort of little pit lined with clay and filled with broken limestone and loam.

Cortusa Matthioli L. (Plate XLVI.)

Stem erect, 6–12 inches high, 3–12 flowered, leafless, densely villous below like the leaf-stalks, covered in upper part, like the flower-stalks, with shorter, weaker hairs. Leaves radical, on long stalks, roundish cordate, 11 or 12-lobed, glabrous above, hairy below and on the margin. Lobes obtuse, coarsely toothed. Flowers in a loose, terminal umbel, nodding on one side. Corolla rose, becoming violet, faintly fragrant, with lanceolate, acute lobes. Involucral bracts lanceolate, entire or serrate, or deeply toothed at the apex. Calyx glabrous, small, with 5 lanceolate, acute segments. The foliage of this plant is very handsome, and altogether it forms a useful and ornamental subject to plant in loam and leaf-mould or peat.

Damp, shady woods, moist spots on debris, or in ravines in the lower Alps up to 6500 feet; very local. May to July.

Distribution.—Eastern Alps, Switzerland (Grisons), and Western Alps of Savoy, Hautes-Alpes and Piedmont; Arctic Russia and Northern Asia.

SOLDANELLA L.

Small Alpine herbs, appearing on the edge of the snow and sometimes flowering through the snow. Flowers solitary or in few-flowered umbels on long stalks, mauve or rarely white. Corolla campanulate, nodding, finely divided into many linear segments. Capsule 5-valved, each valve with 2 teeth.

Only 4 species, inhabiting Central Europe.

Soldanella alpina L. (Plate XLVIII.)

Stems erect, 3–6 inches high, leafless, glabrous or rough, with sessile glands or pubescent from gland-hairs. Leaves radical, dark green, shining, dotted on the under side and often tinged with purple, stalked, roundish cordate or reniform, coriaceous, glabrous, entire, margin wavy or shallowly crenate. Flowers usually nodding or pendent, in a terminal, 1–4 flowered umbel. Fruiting flower-stalk elongated, rigid, erect. Corolla campanulate, funnel-shaped, divided half-way down, bearing in the throat 5 ovate, membranous scales between the stamens and at their base. Anthers about twice as long as the filaments. Style shorter or longer than the corolla (dimorphic). A variable plant.

Moist Alpine pastures ; 4000–9500 feet ; common, and often in great quantities, both on limestone and slate. It appears immediately after the melting of the snow on the Alpine pastures. May to July.

Distribution.—Erzgebirge, Eastern, Central, and Western Alps ; Black Forest, Jura, Auvergne, Pyrenees.

Soldanella pusilla Baumg. (Plate XLVI.)

Stem erect, 1–2 flowered, sometimes rough, with sessile glands. Leaves radical, cordate-reniform or quite orbicular, entire or with a wavy margin, coriaceous, smaller than in the last and more shiny. Flowers nodding or pendent. Fertile flower-stalks elongated, rigid, erect. Corolla campanulate, funnel-shaped, divided more than half-way down, with no scales at the throat, light violet, with darker streaks. Filaments about as long as anthers.

High Alpine pastures, usually on the melting snow. June, July.

Distribution.—Carpathians, Eastern and Central Alps. In Switzerland it appears restricted to the Oberland and from the Simplon eastwards. It prefers siliceous soils, while *S. alpina* is more abundant on limestone.

Soldanella minima Hoppe. (Plate XLVIII.)

Much like the last, but more dwarf (scape 1–2 inches high), and usually with only 1 lilac flower on the stem. Corolla cleft for about one-third the distance down, with no scales at the throat. Leaves are orbicular.

Alpine and subalpine pastures, chiefly in shady places on limestone up to 8300 feet. June, July.

Distribution.—Eastern Alps (Tyrol to Carniola).

Soldanellas can be cultivated without much difficulty in a rather shady place, with a damp surface, close to the edge of a bog. The soil should be a compost of peat or leaf-mould, loam, and sand ; and a top-dressing of leaf-mould and sand should be given in spring and autumn. They cannot be kept too wet in summer or too dry in winter.

Cyclamen europæum L. (Plate XLVIII.)

Growing from a roundish tuber, from the size of a hazel nut to that of a small apple. Leaves stalked, orbicular-cordate, sinuate-crenate, coriaceous, often purplish beneath like the stems. Flower-stalk from the crown of the root coiled spirally towards the ground after flowering ; flowers purple-red, very rarely white, entire at the throat, fragrant. Corolla lobes revolute, acute.

Stony and bushy places (preferably limestone) in subalpine districts. August to October.

Distribution.—Moravia, Eastern, Central, and Western Alps, Jura, Bavaria, Balkan States.

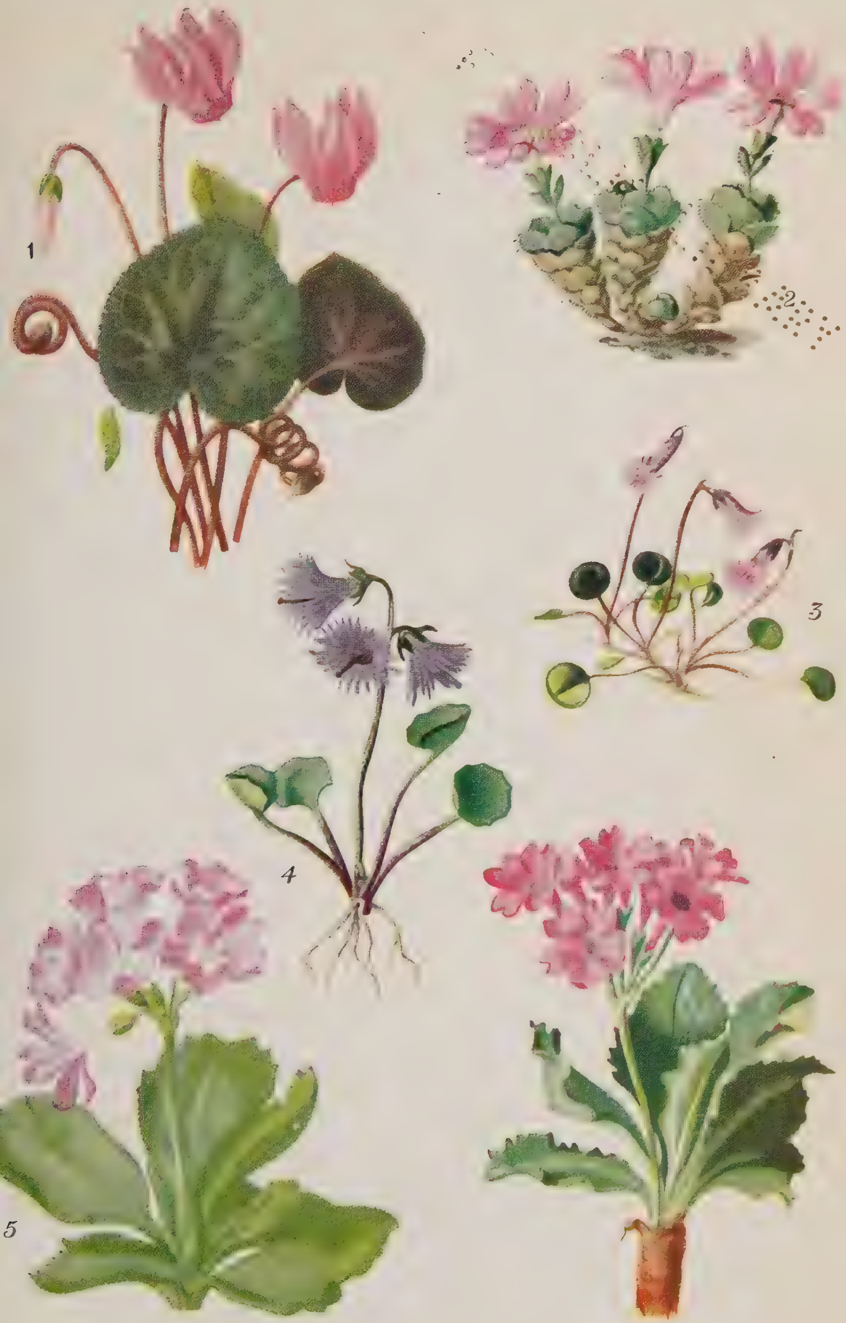

PLATE XLVIII.

1. Cyclamen europæum L.
2. Primula tiroliensis Schott.
3. Soldanella minima Hoppe.
4. Soldanella alpina L.
5. Primula commutata Schott.
6. Primula viscosa Vill.

GENTIANACEÆ

Herbs often bitter, usually glabrous. Leaves opposite and entire without stipules. Flowers in terminal, dichotomous cymes or panicles, with a single flower in each fork, or solitary. Calyx 4–8 toothed. Corolla regular, 4–8 lobed. Stamens 4–8 and alternating with the corolla lobes. Capsule opening in 2 valves with many seeds.

A rather large family, extending nearly all over the world, but chiefly in temperate or mountain regions.

Swertia perennis L. (Plate XLIX.)

Glabrous. Stem erect, 6–12 inches high, 4-edged, simple below and bearing an elongated raceme. Leaves crowded at base of stem, the upper ones opposite, entire, lanceolate, sessile; lower ones elliptical, running into the leaf-stalk. Angles of flower-stalk narrowly winged. Calyx-teeth and corolla segments lanceolate, acuminate. Flowers dark, dingy purple.

Boggy Alpine meadows and peat mosses and other wet places on Alpine pastures; 5000–6800 feet; very local. July, August.

Distribution.—Carpathians; Riesengebirge; Eastern, Central, and Western Alps; Jura, Black Forest; North German plain, Erzgebirge, Pyrenees, Central France, Caucasus.

Pleurogyne carinthiaca Griseb. (Plate XLIX.)

Stem branched, leafy, 3–6 inches high. Leaves oval, acuminate, sessile; root-leaves obtuse, stalked. Flowers solitary. Corolla rotate, light blue. Calyx-teeth lanceolate.

High Alpine pastures and grassy banks of Alpine streams; rare and local. August, September.

Distribution.—Eastern Alps (Tyrol, Salzburg, Carinthia, Glockner district, etc.) and Switzerland (only in Grisons, Glarus, and the Saas Valley); Arctic regions.

GENTIANA L.

Leaves opposite, entire. Flowers usually blue, but also purple, mauve, yellow, and nearly white, solitary or in terminal cymes. Calyx tubular, often angled, with 5 or rarely 4 lobes. Corolla with a narrow campanulate tube and spreading limb divided into 5 or rarely 4 lobes, and occasionally 5 additional ones in the angles. Style remaining attached to the capsule after the flower fades. Stigmas 2. Capsule 1-celled and 2-valved.

A large genus, spread over the northern hemisphere, especially in the mountains and in the higher ranges of both New and Old Worlds, penetrating into the tropics.

Gentiana lutea L. (Plate L.)

Glabrous. Stem erect, stout, 2–4 feet high. Root cylindrical, thick, ringed. Leaves large, elliptical, strongly 5-nerved, the lowermost stalked, channelled; stem-leaves cordate-amplexicaul. Flowers yellow, often with brown spots in apparent whorls. Petals lanceolate, acuminate, 3 times as long as the corolla-tube, i.e. the corolla is divided nearly to the base. Calyx-sheathing, deeply divided on one side. The root is used as a tonic.

Grassy Alpine and subalpine pastures. July to September. Rather rare in the Eastern Alps, common elsewhere.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Vosges, Jura, Black Forest; Central and Southern Europe; Asia Minor.

Gentiana punctata L. (Plate L.)

Stem about a foot high, erect, robust. Stem-leaves oval or lanceolate, sessile, nerved, the lower ones elliptical, stalked. Flowers sessile, in terminal clusters or in whorls. Corolla 6-cleft, campanulate, lobes a quarter the length of the corolla-tube, throat naked. Flowers yellowish, spotted with purple-brown or dark grey. Calyx campanulate, with erect, lanceolate, unequal teeth.

Grassy, sunny spots in Alpine pastures up to 8000 feet. July, August.

Distribution.—Carpathians; Erzgebirge; Eastern, Central, and Western Alps; extends as far east as Macedonia.

This species prefers siliceous soils.

Gentiana pannonica Scop. (Plate L.)

Stem erect, single, few-flowered, 1–2 feet high. Leaves of barren shoots and lower stem-leaves elliptical, acute or shortly acuminate, 5–7 nerved, stalked, with sheathing leaf-stalk; upper leaves ovate-lanceolate or lanceolate, acuminate, 3-nerved, sessile. Flowers sessile, solitary, or in clusters of from 2–5 in the axils of the uppermost opposite leaves, forming a false whorl, the uppermost coalescing into a terminal head. Corolla 1–1½ inches long, dull purple with pale greenish yellow base, and streaked with reddish black, campanulate, 5–7 cleft, throat naked. Calyx-teeth recurved. Root very bitter.

Alpine and subalpine pastures, more common on limestone than slate, 4500–6500 feet. July, August.

Distribution.—Carpathians; Erzgebirge. Eastern Alps. Extremely rare in Switzerland (Curfirsten). Bavaria, Bohemia, Transylvania.

Gentiana purpurea L.

Stem erect, 1–2 feet high, simple. Leaves oval-lanceolate, the lower leaves petioled, the upper sessile. Calyx-lobes erect. Calyx sheathing, bifid. Corolla campanulate, reddish brown or purple outside, yellowish within, rarely white or yellowish; divided one-third of its length into oval, obtuse lobes. Flowers sessile.

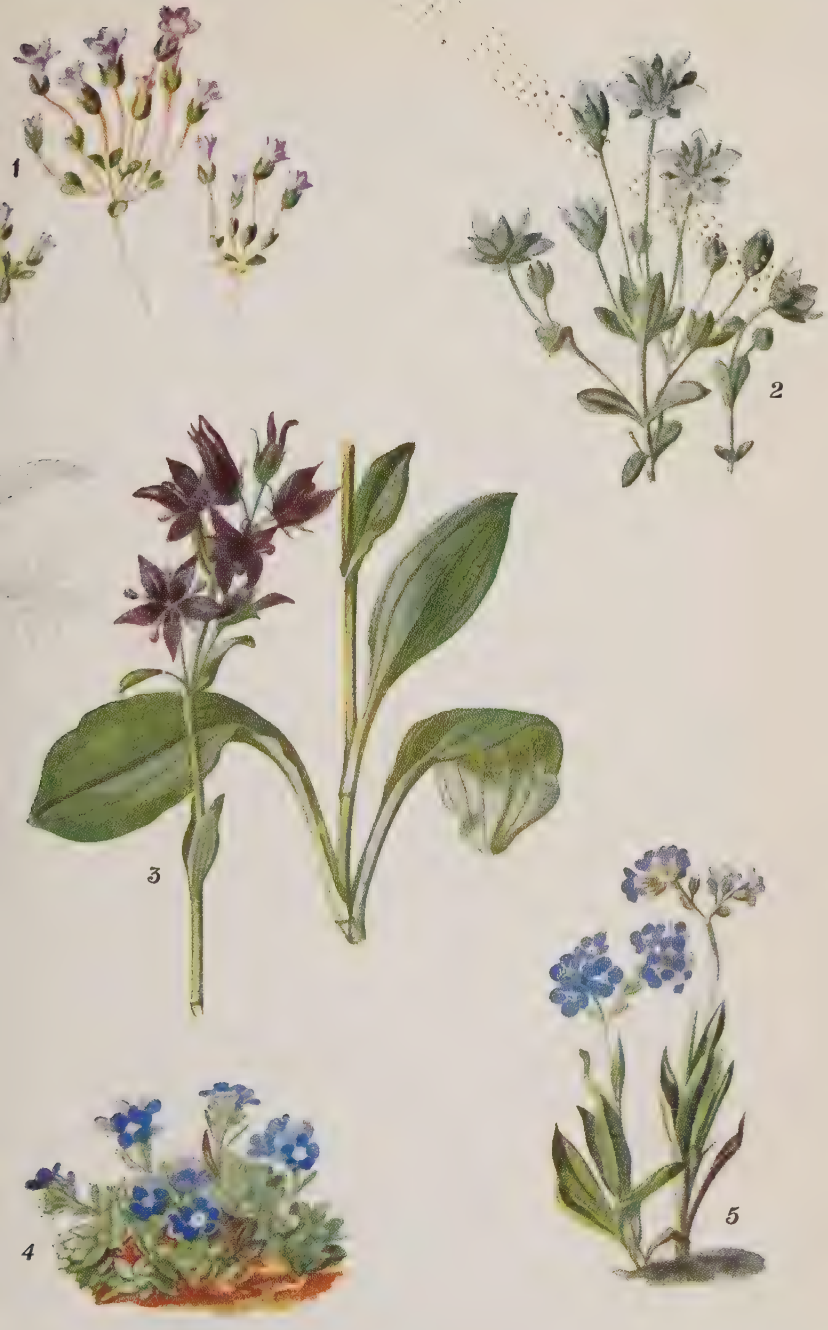

PLATE XLIX.

1. Gentiana nana Wulf.
2. Pleurogyne carinthiaca Griseb.
3. Swertia perennis L.
4. Eritrichium nanum Schr.
5. Myosotis alpestris Schmidt.

[illegible]

Grassy places and pastures of the Alps and sub-Alps up to 8500 feet. July, August.

Distribution.—Tyrol, Styria, Hungary, Bavaria (rare), Switzerland, Western Alps, Southern Norway, Kamtschatka.

Gentiana cruciata L.

Stem erect or ascending, 6–18 inches high, simple, very leafy. Leaves elliptic-lanceolate, 3–5 nerved; stem-leaves sheathing, decussate; upper leaves much longer than the flowers. Flowers blue, rather small for the size of the plant, sessile, campanulate, 4-cleft (the lobes being triangular, acute) in a dense panicle at the leafy top of the stem. Calyx short, with 3–4 spathulate teeth.

Thickets and grassy, gravelly places on the Alps and sub-Alps, not often above 5800 feet, and usually on limestone. Frequent in the plains. June to September.

Distribution.—Europe, Western and Northern Asia.

Gentiana asclepiadea L. (Plate L.)

Root very long and tapering, sometimes 2 feet or more in length. Stem erect, simple, 1–3 feet high, many-flowered, leafy except at the base. Stem-leaves lanceolate or ovate-lanceolate, acuminate, 5-nerved, sessile, from a rounded base; no root-leaves. Flowers usually in clusters of 2–3 in the axils of the upper leaves, forming a long terminal leafy, spicate cyme. Corolla campanulate, 5-cleft, large (1½–2 inches long), dark azure-blue or ultramarine, variegated internally with white streaks and dark spots, throat naked. Corolla-teeth not fringed, lanceolate, acuminate. Calyx tubular, with 5 very short linear teeth.

Bushy subalpine regions and stony Alpine pastures up to 6800 feet, especially on limestone; a very handsome species. July to September.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps; Vosges, Jura, Corsica, Caucasus, Asia Minor.

Gentiana Froehlichii Jan.

Stem 1–4 inches high, round, erect or ascending. Root-leaves in rosettes, linear-lanceolate, shining, connate into a loose sheath. Flowers usually 1, rarely 2, terminal. Corolla campanulate, 6-cleft to one-fifth its length, not bearded at the throat, light blue, not dotted; corolla-tube 4 times as long as limb. Anthers united. Stigma wedge-shaped.

On high ridges in the Eastern Alps (Carniola and Carinthia). July, August.

Gentiana frigida Haenke. (Plate LI.)

Stem erect, simple, 1–2 flowered, 3–4 inches high. Leaves linear-lanceolate, somewhat fleshy; root-leaves narrowed into a sheathing root-stalk; stem-leaves sessile, amplexicaul. Corolla yellowish white, with 5 bluish streaks and scattered dots, campanulate, 5-cleft, beardless, transparent. Calyx bluish-green. Anthers free. Style short.

On high primitive rocks above 6000 feet; local. July, August.

Distribution.—Carpathians, Eastern Alps (Styria).

Gentiana alpina Vill. (*G. acaulis* L. part.).

Stem very short and sometimes almost wanting. Root-leaves in small rosettes, small, oval, sub-obtuse, leathery, 1-nerved; 1 pair of stem-leaves often placed immediately below the calyx, lanceolate, acute. Calyx-lobes lanceolate, sub-acute, rarely contracted at the base, sinus between calyx-lobes usually sharp. Corolla a deep blue with greenish streaks, rarely mauve or white, 1–1½ inch long; corolla-lobes rather obtuse and short.

Grassy Alpine pastures up to 8500 feet; locally abundant, but much less common than *G. excisa* Presl., and in Switzerland in the southern ranges only. June to July.

Distribution.—Eastern, Central, and Western Alps, as far south as Provence; Jura, Pyrenees, Spain.

Gentiana excisa Presl. 1828 (*G. Kochiana* Perr. et Song. 1853). (Plate LI.)

Larger and taller than the last, with which Linnæus combined it and the next to form *G. acaulis* L. Stem 2–4 inches high, erect, with one or rarely two pairs of small lanceolate leaves; stem much elongated on maturity. Leaves larger and softer than in *G. alpina*, but very variable in shape and size. Calyx-lobes oval-lanceolate, from a narrow base, contracted, shorter and broader than in the last and spreading. Sinus between calyx-lobes truncate, the membrane connecting the divisions of the calyx more developed. Corolla 1½–2½ inches long, campanulate, deep blue, spotted or streaked with green within, and often of a duller or purplish-blue, very rarely white or violet. Corolla-lobes large, toothed and deflexed.

Pastures in the primitive or granitic Alps, less often on limestone. Often abundant from 3800–8500 feet. May to August, according to position.

Distribution.—Eastern, Central, and Western Alps; Jura, Corbières, Pyrenees; Central Europe.

This Bell-Gentian is the one which is generally called in England *G. acaulis*, and too frequently goes under the absurd, diminutive title of 'Gentianella' in books on gardening. De Candolle named it *G. acaulis* var. *latifolia*.

Gentiana Clusii Perr. et Song. (Plate LI.)

Stem short, often almost wanting. Radical leaves coriaceous, stiff, lanceolate or elliptic-lanceolate, acute or acuminate. Stem-leaves much smaller, oval-lanceolate, sharply acuminate; uppermost stem-leaves rough at the edges. Corolla always peduncled

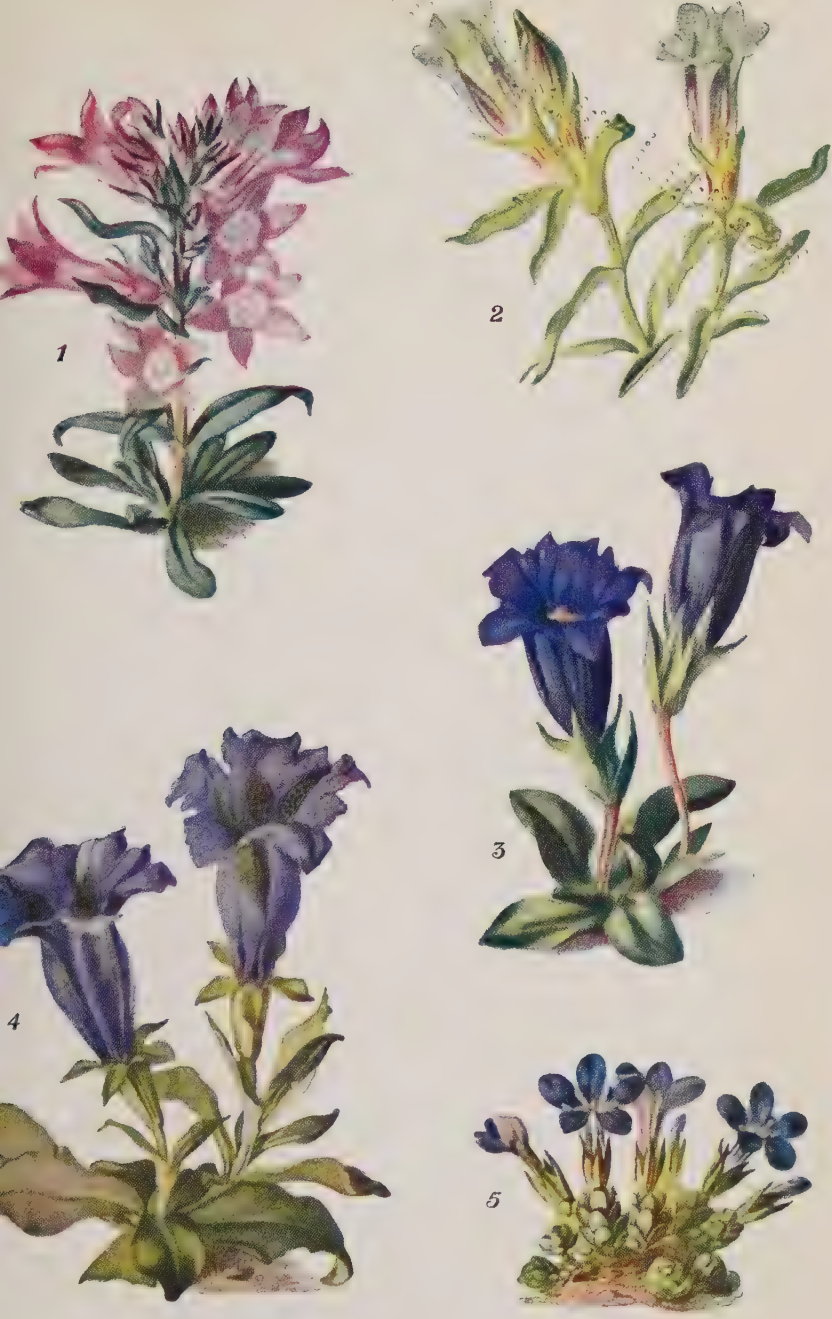

PLATE LI.

1. Gentiana obtusifolia Willd.
2. Gentiana frigida Haenke
3. Gentiana Clusii Perr. et Song.
4. Gentiana excisa Presl.
5. Gentiana brachyphylla Vill.

(peduncles much elongated after maturity), azure-blue, not spotted or streaked with green. Calyx-lobes always very acute, not contracted at the base, about half length of calyx-tube; sinus usually acute.

Alpine pastures on limestone and limestone rocks from 4000–8500 feet, lower in the Jura, and in Cantons Vaud and Zurich. May to July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Jura, Cevennes.

Sometimes this species and *G. Kochiana* seem to mutually exclude the other in their respective areas.

Gentiana angustifolia Vill.

Stem 3–4 inches high, erect. Rosette leaves linear-lanceolate, narrow, obtuse or shortly acuminate, 3–5 times as long as broad, soft and shiny. Calyx-lobes spreading, acute, and contracted at the base, the sinus between the calyx-lobes being broad. Corolla-lobes acute. Flowers solitary, very large.

Limestone Alpine pastures; rare. May to July.

Distribution.—Central and Western Alps; rare in Switzerland.

Gentiana bavarica L. (Plate LII.)

Stem erect or ascending, simple, leafy, 2–5 inches high, 1-flowered. Leaves obovate, or nearly spathulate, obtuse, slightly 3-nerved, crowded, except sometimes the uppermost, mostly the same size and form, and imbricate in the young shoots, the lowermost not in rosettes. Corolla saucer-shaped, 5-cleft, handsome, deep azure-blue.[1] Lobes not fringed. Throat naked. Style deeply 5-cleft.

Damp pastures of the higher calcareous Alps; local, but often in great masses; 5000–8500 feet. June to September.

Distribution.—Eastern, Central, and Western Alps. Bavaria.

Gentiana brachyphylla Vill. (Plate LI.)

Stemless. The flowers larger than the rest of the plant. Rosette of leaves close to the ground, composed of short, thick, ovate, acuminate, imbricate leaves, with the flower, nearly an inch long, sessile upon it. Calyx half length of the long corolla-tube, which is narrower and more slender than in *G. verna*. Corolla azure-blue.

Highest Alpine pastures and rocks above. Reaches 4200 metres on the Matterhorn. July, August.

Distribution.—Eastern, Central, and Western Alps.

Sometimes considered a var. of *G. verna* L.

Gentiana verna L. (Plate LII.)

Stem erect or ascending, simple, few-leaved, 1-flowered, 1–4 inches high. Leaves ovate, elliptical or lanceolate, acute, slightly 3-nerved, the lowermost larger, in rosettes, the upper 1 or 2 pairs distant. Corolla saucer-shaped, 5-cleft, teeth not fringed, throat naked, white. Style undivided. Flowers handsome, light or dark azure-blue, varying considerably, and occasionally mauve or white.

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[1] *With violet flowers on Mt. Blanc range in June, 1908.*

Alpine and subalpine meadows and pastures; abundant, and often in large clusters. Descends far into the plains, and sometimes ascends to at least 10,000 feet. April to July.

Distribution.—Carpathians; Erzgebirge; Eastern, Central, and Western Alps, Black Forest, Jura, Auvergne, Pyrenees; Central and Southern Europe, Caucasus; Western and Northern Asia. (Rare in British Isles.) It is not infrequent to find stray blossoms in autumn in Switzerland.

Gentiana imbricata Froel. (non Schleich.). (Plate LIII.)

Stem 1–2 inches high, ascending. Leaves ovate-lanceolate, with rough edges, crowded even on the elongated stems. Flowers terminal, nearly sessile. Corolla salver-shaped, 5-cleft, blue; corolla-segments ovate, acute, somewhat concave. Style undivided. Stigma hemispherical.

Highest Alpine ridges, 7000–10,000 feet, on primary rocks; local. July, August.

Distribution.—Eastern Alps (Tyrol and Carniola).

This must not be confused with *G. imbricata* Schleich., which is a var. of *G. bavarica.*

Gentiana pumila Jacq. (Plate LIII.)

Stem erect or ascending, simple, leafy, 1-flowered, 1–2 inches high. Root putting out branched filiform, fragile runners and leafy stolons, as well as flowering stems. Leaves linear or linear-lanceolate, acuminate, inconspicuously 1-nerved; lowermost leaves more or less crowded with a rosette, the upper 2–3 pairs distant. Corolla salver-shaped, 5-cleft. Tube cylindrical. Segments not fringed. Throat naked. Style undivided. Flowers deep blue. Habit of *G. pyrenaica.*

High Alpine pastures; local. July, August.

Distribution.—Pyrenees (Aragon), Dauphiny, Apennines (Monte Corno), Tyrol, Carinthia, Styria, Transylvania.

Gentiana pyrenaica L.

Stem ascending from a creeping base, 2–3 inches high, densely leafy. Leaves small, linear-lanceolate, mucronate, rough at edges. Flowers a rich violet, solitary, very shortly peduncled. Corolla-lobes 10, unequal, of which 5 are oval, obtuse, and 5 smaller and toothed. Capsule elliptical.

Damp pastures and banks of streams in the mountains at about 4000–5000 feet; local.

Distribution.—Carpathians, Eastern Pyrenees, Ariège, Aude; Western Asia. Not known in the Alps.

Gentiana Rostani Reuter.

Closely resembles *G. bavarica* L., of which it may be only a variety. It has only 2 pairs of narrow cauline leaves, about an inch apart, and a rosette of narrow lanceolate leaves. Flowers deep azure blue.

Damp Alpine pastures and by streams at about 6500 feet.

Distribution.—French and Italian Maritime Alps; rare. July.

Gentiana nivalis L. (Plate LII.)

Annual. Stem 1–6 inches high, erect, leafy, somewhat fragile, usually cymosely branched and many-flowered, less often simple and 1-flowered. Leaves acute or obtuse, 3–5 nerved; root-leaves ovate in rosettes; stem-leaves lanceolate. Calyx cylindrical, with 5 prominent angles and acute teeth. Corolla rotate, with a cylindrical tube, naked throat and acuminate, unfringed teeth. Flowers small, blue, or sometimes mauve, only opening in sunshine, very rarely white.

Alpine meadows and pastures; 5000–10,000 feet. July to September.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Pyrenees, Central and Arctic Europe, Asia Minor, North America, Greenland. (British, very rare.)

Gentiana utriculosa L. (Plate LII.)

Annual. Much branched, 2–8 inches high. Stem occasionally simple and 1-flowered, but usually branched and many-flowered. Leaves 3–5 nerved; root-leaves ovate in rosettes; stem-leaves lanceolate. Calyx elongated, bladder-like, broadly winged at the 5 angles, pale green between the wings. Calyx as long as the whitish corolla-tube. Corolla rotate; corolla-tube cylindrical. Lobes not fringed. Throat naked. Flowers azure-blue, but paler than in *bavarica.*

Rather wet Alpine pastures, reaching 7000 feet and descending to the plains; local. June to September.

Distribution. — Eastern, Central, and Western Alps; Southern Germany as far as Mannheim, Alsace, Central Europe.

Gentiana prostrata Haenke. (Plate LIII.)

Stem 2 inches high, branched at the base, leafy, 1-flowered, prostrate and ascending, with barren, leafy runners. Leaves obovate, not in rosettes. Appendages between the corolla segments half as long as the segments. Throat of corolla-tube naked. Flowers pale blue. Calyx cylindrical, angular.

Pastures; 6500–9000 feet. July, August.

Distribution.—Eastern Alps (Salzburg, Tyrol, Carinthia, etc.).

Gentiana tenella Rottb. (*G. glacialis* A. Thomas). (Plate LIII.)

An annual, slender plant. Stem 1 inch high and simple, or 2–4 inches and branched. Root-leaves spathulate; stem-leaves lanceolate. Flower-stalks very long, naked, slender. Flowers small, 4-cleft, mauve, or rarely white. Calyx with 4 very deep oval-lanceolate lobes.

Damp, grassy places on Alpine pastures and banks, 6000–9000 feet; local.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees, Transylvania, Arctic regions, Altai.

Gentiana nana Wulf. (Plate XLIX.)

Cæspitose, 1–2 inches high. Stem mostly dichotomous. Leaves ovate, obtuse, small. Flower-stalks elongated. Corolla 5-partite, funnel-shaped, bearded at the white throat. Calyx inflated. Flowers a beautiful violet.

Highest Alps near the edge of the snow, 7000–10,000 feet; rare. August, September.

Distribution.—Eastern Alps (Salzburg and Carinthia).

Gentiana campestris L.

This common (British) annual species, with 4-lobed lilac corolla and calyx with 2 very large ovate-acuminate outer lobes and 2 smaller lanceolate ones, is very frequent in the Alps, and often ascends to 9000 feet or 2745 metres. It is frequently seen with darker violet or rarely white flowers; sometimes in the Alps the plants are 8 inches high and very much branched. The smallest single-headed specimens have flowers as large as the older ones.

Distribution.—Mountains and hills in Central and Northern Europe.

Gentiana obtusifolia Willd. (Plate LI.)

Stem erect, leafy, and floriferous. Leaves sessile, lanceolate; root-leaves obovate or spathulate, obtuse, uppermost ovate-lanceolate, acute. Calyx 5-toothed, teeth linear-lanceolate, nearly equal. Corolla deeply 5-cleft, bearded at the throat, pale violet, rarely white.

Alpine pastures and rocks up to 7500 feet. July, August.

Distribution.—Carpathians, Erzgebirge, Eastern and Central Alps.

This probably includes *G. compacta* Hegets, but the naming of this group of Gentians is very uncertain.

Gentiana germanica Willd.

This beautiful annual autumnal Gentian, with its long panicle of purple-red tubular flowers, and frequently reddish stems and leaves, does not often get above the bushy places in the subalpine region, though recorded from 7000 feet in the Eastern Alps.

It flowers from August to October, and prefers limestone. It is spread throughout Central Europe, and is occasionally found in England on the chalk.

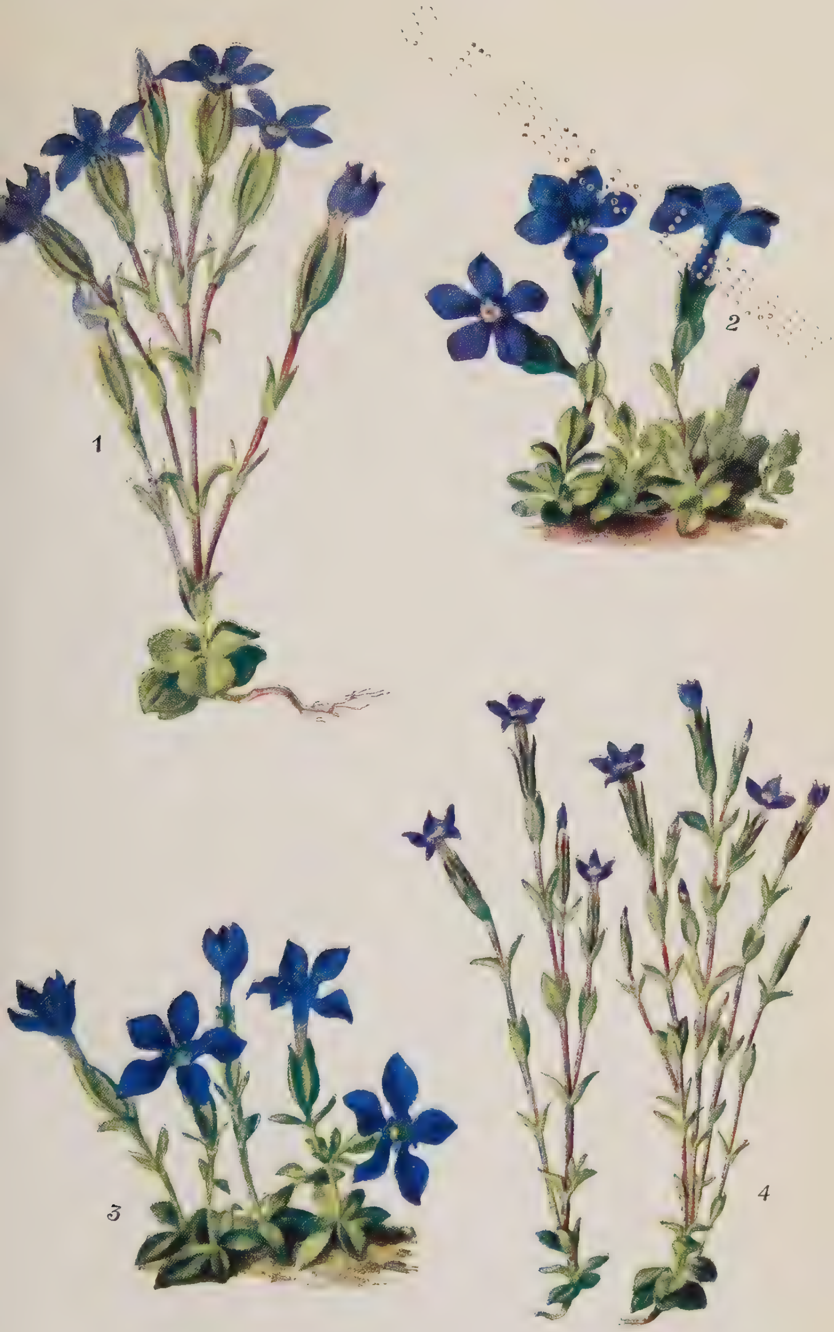

PLATE LII.

1. Gentiana utriculosa L.
2. Gentiana bavarica L.
3. Gentiana verna L.
4. Gentiana nivalis L.

Gentiana ciliata L.

Biennial or perennial. Stem 3–10 inches high, simple or branched, leafy to the top. Leaves erect, lanceolate or linear-lanceolate, acute, 1-nerved. Flowers rather pale blue, large and handsome, solitary or several on a stem. Corolla divided to the middle into 4 spreading lobes, which are toothed and strongly ciliated. Calyx campanulate, with 4 lanceolate, acuminate segments, much shorter than the long tube. The blue may be called electric.

Pastures and sloping banks in the Alps, sub-Alps, and plains, especially on shale or limestone. August to October. The writer has it from 8250 feet on the Aiguille de Goléon in Dauphiny, and from near Annecy at only 1650 feet. It is distinctly an autumnal species.

Distribution.—Central and Southern Europe, Western Asia.

Gentiana Pneumonanthe L.

This very beautiful species is, of course, not Alpine, and it is less frequent in Switzerland than on some of the damp, sandy heaths of England. The writer has not observed it higher than the base of the Brunig Pass in Switzerland, in marshy ground by the railway side. It is mentioned here because no collection of Gentians in the garden should be considered at all complete without it. It is easily grown in damp peat and sand or in the bog garden, and flowers from August to October. White-flowered forms with the usual pale green markings are extremely rare, but the writer found one in Dorset last autumn, and Mr. Crittenden, Director of the Wisley Gardens, reported to the *Gardeners' Chronicle*, November 19th, 1910, that a gentleman had sent him so fine and floriferous a specimen of the white variety that it bore 18 flowers on 1 stalk. It had been cultivated from a root found wild on Chobham Common. The sender is trying to raise a stock of white-flowered plants.

CULTIVATION OF GENTIANS

Unfortunately, many of the Gentians are unreliable in cultivation; they dislike disturbance, and long drought is often fatal to them. Even *G. acaulis* (in the broad sense) will flourish in one garden, and languish, under almost similar conditions, in another. For that reason it is almost useless to give any cultural hints, except that a good loam, mixed with limestone or gravel, and a well-drained position suit it best. *G. verna* is quite difficult to grow well in this country. It is not easy to raise from seed, most averse to being disturbed, and very easily killed, after the cold east winds of spring, when it makes no growth, by drought or too much sun in the early summer, at which time it should be copiously watered. It is difficult to get good, compact, well-established plants even in the Alps, though this may sound paradoxical to those who have not tried. The root and stems are very slender. Sometimes it will succeed if planted on a half-buried sod of turf, grass side down. It seems to like grass, and, indeed, it is better to plant it either in a fine, short grass or mixed with other small plants, which tend to keep it from getting dried up. In nature it sometimes forms beautiful pictures when growing with and through a mass of *Dryas octopetala*, and this combination, or with *Polygala Chamæbuxus*, can be tried in the garden, if the latter plants are properly kept in check. But in any case *G. verna* must not be considered a rock plant. It is better placed in some level, sheltered spot, in deep soil, at the base of the rocks, where it can enjoy all the rain that falls. Some gardeners and nurserymen have found that a few pieces of charcoal placed among the roots of *G. verna*, when being established in pots, is beneficial. The pots should be well plunged in ashes or sand to keep them cool.

G. bavarica is almost impossible to grow in this country, but *G. pyrenaica*, which frequents similar damp, grassy places in the Pyrenees, is less difficult, and will sometimes do in damp peat and sand in full sun. It is very distinct, both in form and colour, and if once established forms exquisite masses of trailing leafy shoots and rich violet blossoms. *G. ciliata* also is not easy to cultivate, and it is one of the prettiest and most distinct. It wants a sunny, well-drained position, and, if possible, protected from much wet in winter. A mixture of loam and finely broken limestone would suit it, or it might be tried on marl or shale. Perhaps it would thrive on some of the finely disintegrated shales in Lias districts, for in the Alps it is often seen on shaly slopes.

POLEMONIACEÆ

Polemonium L.

A small genus of about 10 species, inhabiting Europe, Asia, and America.

Polemonium cœruleum L. (Plate LIII.)

Stem 1–2 feet high, erect, furrowed, hollow, glabrous like the leaves, or with a few scattered hairs. Rachis of panicle glandular-downy. Leaves pinnatifid, segments ovate-lanceolate or lanceolate, entire, acute or acuminate, often curled, dark green. Flowers in a terminal panicle, handsome, bluish or white, with orange-yellow anthers.

Margins of woods and boggy meadows, and by streams in sub-alpine districts, especially on turf. May, June.

Distribution. — Carpathians, Eastern and Central Alps, Savoy, Jura, Pyrenees, Caucasus, Siberia, North America, Central and Northern Europe. (British.)

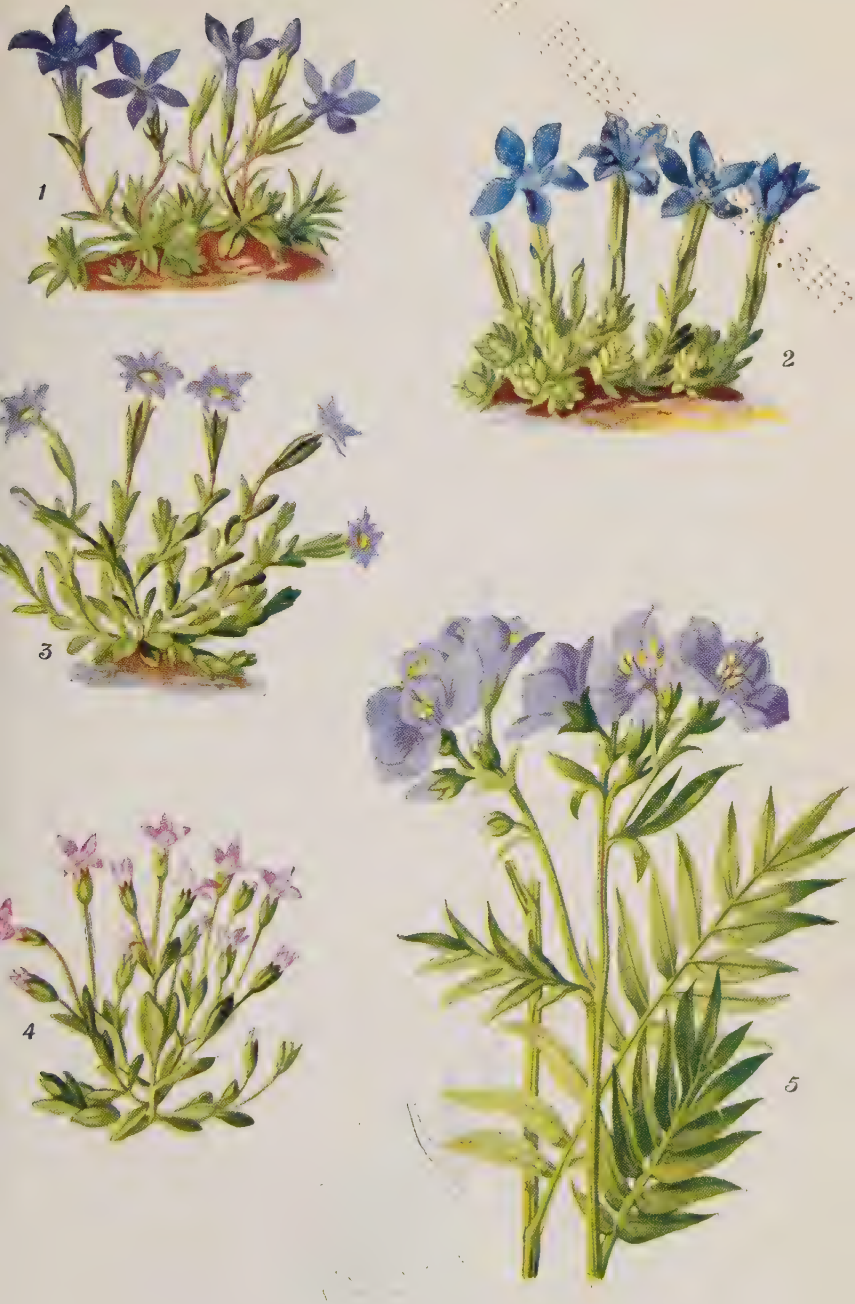

PLATE LIII.

1. Gentiana pumila Jacq.
2. Gentiana imbricata Frœl.
3. Gentiana prostrata Hænke.
4. Gentiana tenella Rottb.
5. Polemonium cœruleum L.

[illegible]

GESNERIACEÆ

A family largely confined to tropical regions.

Ramondia pyrenaica Rich.

This well-known rock plant, with its prostrate rosettes of oval and densely woolly leaves and beautiful mauve flowers, comes from the French and Spanish Pyrenees, and from the Balkans in Servia. It should have a vertical position on the rockery by preference.

BORAGINACEÆ

Herbs usually rough with coarse hairs. Leaves alternate, simple, and usually entire. Flowers in 1-sided spikes or racemes, rolled back when young, and usually forked. Calyx of 5 teeth. Corolla regular, or slightly irregular, monopetalous, with a 5-cleft limb. Stamens 5, inserted on the corolla-tube. Ovary 4-lobed, with a simple style inserted between the lobes. Fruit of 4 1-seeded nuts, like seeds, and enclosed within the calyx.

A large family in the northern hemisphere, with a few representatives in the tropics and southern hemisphere.

Cerinthe glabra Miller (*C. alpina* Kit.).

A glabrous plant. Stem 12–18 inches high, erect, branched, leafy to the summit. Leaves ovate-cordate, embracing the stem. Flowers yellowish or purplish, rather small, pendent, in a long panicle, very dense at the top. Sepals lanceolate, obtuse, not ciliated as in *major*, nor toothed as in *minor*. Corolla about one-third longer than the calyx, with short, triangular, sub-obtuse teeth. Anthers terminated by a short appendix. Nuts small.

Pastures, stony slopes, and borders of woods in Alpine and sub-alpine districts up to 6000 feet, especially on limestone. June to August.

Distribution.—Alps, Jura, Corsica, Pyrenees, Central Europe.

Pulmonaria angustifolia L. (*P. azurea* Bess.).

Stems 6–12 inches high, erect, leafy. Leaves not spotted. Radical leaves lanceolate, 8–10 times as broad as long, lengthened into a broadly-winged leaf-stalk ; stem-leaves oblong or oblong-lanceolate, sessile, the lower ones slightly attenuated at the base, the upper ones amplexicaule. Leaves and calyx covered with short, spreading and glandular hairs. Corolla reddish at first, and then a deep azure-blue, flowers in short racemes. Calyx cylindrical, cleft to the middle, teeth lanceolate-acute. Calyx pendent after flowering. A very beautiful plant.

Bushy Alpine places up to 6500 feet ; local.

Distribution.—Eastern, Central, and Western Alps ; Pyrenees, Central and Eastern Europe, Caucasus, Asia Minor.

Eritrichium nanum (All.) Schrader. (Plate XLIX.)

A very dwarf plant, forming dense cushions, covered with azure-blue flowers resembling those of *Myosotis*. Stems numerous, ascending, 1–2 inches high, forming small tufts coloured grey-green from the woolly hairs. Leaves of the sterile branches crowded, imbricate, spathulate, with bristly cilia on the margins, and long wool on both sides, especially when young; leaves of flowering branches obovate or elliptical, not crowded, not more than 3 lines long and 1 line broad. Flowers 1–5, in crowded terminal scorpioid racemes, as large as those of *Myosotis palustris*, but deeper blue. Nutlets fringed with small bristles.

Exposed rocks and *arêtes* in the high siliceous Alps, 8000–10,000 feet; very local, and not often in large quantity. July, August.

Distribution.—Eastern, Central, and Western Alps from Carinthia round to the Maritime Alps; Caucasus, Arctic regions, Altai.

Very difficult indeed to cultivate in this country, and most attempts have ended in failure. Mons. Correvon, of Chêne Bourg, Geneva, succeeds in growing it in sphagnum, but his treatment is unsuited to the climate of these islands. Full instructions for growing this little gem are given by W. A. Clark in his useful little book on *Alpine Plants and how to Grow Them* (1901), p. 39. Mr. Clark appears to have had in full flower in May from 30 to 40 plants when he was Alpine foreman at the famous York Nurseries of Messrs. Jas. Backhouse & Sons.

Myosotis alpestris Schmidt. (*M. pyrenaica* Pourret). (Plate XLIX.)

Root at first tapering, afterwards forming an oblique rootstock with many fibres. Stem erect or ascending, 2–6 inches high, branched, covered like the whole plant with spreading hairs. Leaves entire, the lowermost obovate-lanceolate, obtuse, running down into a leaf-stalk; upper leaves narrowly lanceolate, acute, sessile. Flowers often lilac at first, azure-blue when mature; in leafless, unilateral scorpioid cymes. Calyx closed after flowering, covered with spreading hairs. Flower-stalks often twice as long as the calyx, and at length nearly horizontal. Corolla-tube enclosed in the calyx; limb expanded, flat. *M. alpestris* passes into *M. sylvatica*, but has stiffer hairs, shorter cymes, thicker flower-stalks, larger calyx, and more compressed habit. Occasionally the flowers are white.

Grassy or stony pastures of the Alps and sub-Alps up to 10,000 feet. June to August.

Distribution.—Eastern, Central, and Western Alps, Jura, Vosges, Corsica; Pyrenees, Caucasus; Europe, Morocco, Siberia, North America, Scandinavia. (British.)

We follow Schinz and Keller in failing to see any specific difference between *M. alpestris* and *M. pyrenaica*, and even at 6500 feet in the

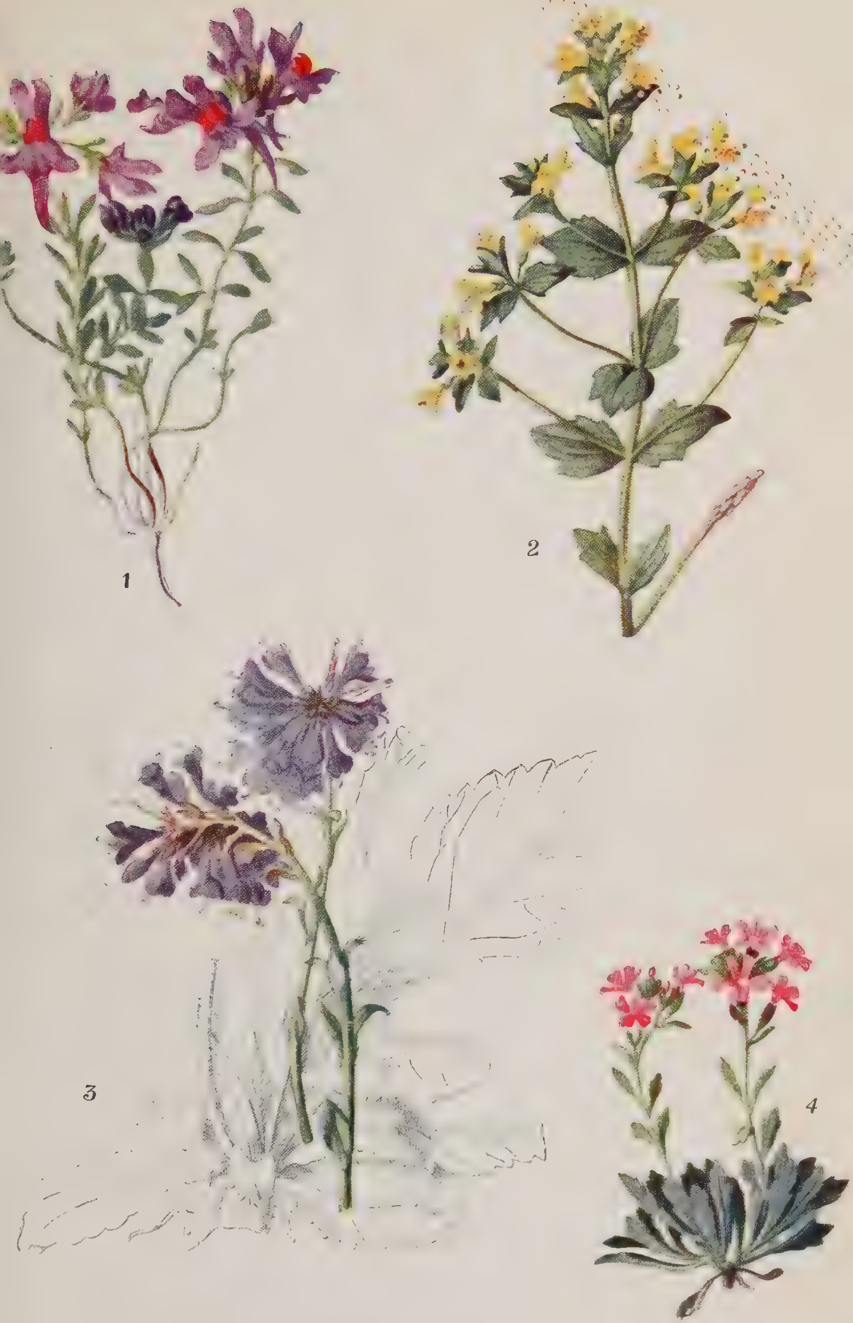

PLATE LIV.

1. Linaria alpina Mill.
2. Tozzia alpina L.
3. Wulfenia carinthiaca Jacq.
4. Erinus alpinus L.

Alps every intermediate form of *M. alpestris* and *M. sylvatica* can be found.

M. alpestris requires to be kept dry in winter. It grows freely from seed, and can be planted in loam in chinks of sandstone or limestone, tightly wedged with plenty of soil round the roots. To keep water from killing it in the non-active season, a stone could be placed over it in late autumn and removed in the early spring.

SCROPHULARIACEÆ

Corolla monopetalous, usually 2-lipped and irregular, with 4 or 5 lobes. Stamens 4 or rarely 2, inserted on the tube of the corolla. Ovary 2-celled. Style simple. Ovules numerous. Fruit a many-seeded capsule.

A large family, widely spread over the globe, though most abundant in the temperate regions.

LINARIA Hill.

Corolla personate, spurred. Stamens 4. Stigma notched or 2-lobed. Capsule of 2 nearly equal cells, dehiscing by pores.

A numerous genus of mostly annual plants, especially abundant in South-western Europe.

Linaria alpina Miller. (Plate LIV.)

Annual or biennial. Root tapering, fibrous, whole plant glabrous and glacous. Stem procumbent or ascending at the apex, simple or branched, weak, glabrous like the leaves. Leaves sessile, linear or linear-lanceolate, obtuse, glaucous, entire, in whorls of 3 or 4, or the upper ones alternate. Flowers in short, loose racemes; flower-stalk as long as the calyx. Corolla large, violet, with orange tip. Seeds elliptical, flat, smooth, surrounded by a membranous rim.

Debris and moraines in the calcareous Alps and sub-Alps; common, and descending into the valleys in the dry beds of streams. July to September.

It also mounts to a great height on some of the highest peaks, and has been gathered at 3800 metres or 12,460 feet on the Grivola.

Distribution.—Eastern, Central, and Western Alps; Jura, Carpathians, Transylvania, Balkans, Pyrenees, Spain.

Linaria petræa Jord.

May be only a variety of the above, of looser habit, with blue-violet flowers, usually without any orange, and seeds less broadly winged.

It grows in similar places, but is far from common, except in the Jura. It reaches a height of about 6600 feet above Lanslebourg in Southern Savoy.

Scrophularia Hoppei Koch.

Stem 1–2 feet high, terete. Leaves pinnate or pinnatifid. Segments inciso-dentate. Cymes spreading, glandular-hairy. Calyx-lobes roundish, very obtuse. Upper lip of corolla more than half length of tube. Flowers reddish brown. Anthers bright orange-coloured.

Dry, stony places in Alpine and subalpine valleys; local. June to September. Seen by the writer at 6600 feet near Lanslebourg growing with *Linaria petræa*. Closely allied to *S. canina* L.

Distribution.—Alps, Jura, Cevennes, Pyrenees. Very local in Switzerland.

Erinus alpinus L. (Plate LIV.)

Cæspitose and creeping. Fruiting-stems ascending. Leaves spathulate, serrate or crenate in the upper half; lowest leaves in rosettes; stem-leaves alternate, glabrous or slightly hairy. Flowers in terminal corymbs, reddish purple (variable in tint). Corolla saucer-shaped, with slender tube and unequally 5-partite limb.

Rocky Alpine and subalpine pastures, dry beds of streams, etc., especially on limestone; but on the Rigi it grows on red conglomerate. Sometimes it descends to the plains both in Switzerland and Savoy (Lavoux and Annecy). May to October.

Distribution.—Central and Western Alps, Jura, Cevennes, Corbières and Pyrenees, Spain, Sardinia, Balearic Isles, Algeria.

Easily cultivated in sandy soil mixed with limestone, and is a useful plant for running over rocks and old walls.

DIGITALIS L. (Foxglove)

Flowers in long terminal racemes, large, purple or yellow, rarely white. Corolla campanulate or ventricose, with bearded throat. Stigma 2-lobed. Capsule oval, acuminate, with 2 cells.

About 18 species, inhabiting Europe, South Africa, and Central and Western Asia.

Digitalis grandiflora All. (*D. ambigua* L.).

2–3 feet high. Leaves oblong-lanceolate, serrulate, ciliate. Corolla broadly campanulate, large, glandular-pubescent, dull yellow or yellow-ochre, with brown veins within. Sepals lanceolate, acute.

Woods and bushy, rocky places in the Alps and sub-Alps; very common on the limestone about Engelberg. June to September.

Distribution.—Alps, Pyrenees, Jura, Ardennes, Vosges; Europe from Belgium and Spain to Russia and Western Siberia.

Digitalis lutea L.

1–3 feet high, usually glabrous. Leaves lanceolate, shining, glabrous on both sides, finely serrated, the lower ones shortly petioled; upper leaves sessile and rounded at the base. Flowers pale lemon-yellow, neither veined nor spotted, in a long compact, tapering, unilateral raceme. Flowers much smaller than the last. Calyx-lobes linear-lanceolate. Capsule ovoid, conic, glabrescent.

Woods and bushy, stony places in subalpine districts; common. June to August.

Distribution.—Central Europe, from Belgium and Spain to Hungary and Galicia, Morocco.

PÆDEROTA L.

Flowers in terminal, more or less unilateral spikes. Corolla spurred, not bearded. Stamens 2, at the base of the corolla-tube, beneath a ring of hairs. Stem leafy. Leaves opposite.

Pæderota Ageria L.

Whole plant nearly glabrous. Stem 4–6 inches high, ending in an elongated raceme. Leaves opposite, ovate-lanceolate, acute, serrate, shortly stalked, the lowermost smaller and rounder, sessile. Corolla pale yellow, upper lip bifid. Stamens shorter than corolla.

Rocky places in the Eastern Alps above 5000 feet; local. June, July.

Distribution.—Tyrol to Carniola.

Pæderota Bonarota L.

Whole plant downy. Stem erect, 4–6 inches high, ending in an ovate raceme. Leaves ovate, toothed, stalked; the upper ones bluish green; lowest pair small and sessile. Corolla blue, upper lip undivided. Stamens longer than corolla.

Stony places in the primitive Eastern Alps above 5000 feet. June, July.

Distribution.—Lombardy and Southern Tyrol to Carniola.

Wulfenia carinthiaca Jacq. (Plate LIV.)

Stem 6–18 inches high, erect, round, with scattered green scales, woolly below. Root-leaves obovate-lanceolate, running into the leaf-stalk, coarsely and bluntly serrate, coarsely crenate near the apex, 4–6 inches long, 1–2 inches broad, thickish, smooth, shining. Flowers in spicate, 2-rowed racemes, violet-blue; flower-stalks bent downwards, erect when in fruit. Capsule ovoid, obtuse.

Rich soil in the calcareous Alps; rare; above 5000 feet. June, July.

Distribution.—Upper Carinthia (Kühweger Alps and Watschiger Alp).

Tozzia alpina L. (Plate LIV.)

Rootstock covered with succulent, imbricate scales, with thick fibres among them, forming an ovoid, compact body. Stem erect or ascending, succulent, quadrangular, with short hairs on the angles, with opposite branches from the middle, and a pair of leaves at the axils of each pair of branches. Leaves ovate, acute or obtuse, sessile, glabrous, coarsely serrate or entire. Flowers opposite in the axils of the upper leaves, shortly stalked, forming short, loose, leafy racemes at the summit of the branches; flower-stalk downy, recurved when the fruit is ripe. Corolla yellow, with red spots on lower lip. Perhaps semi-parasitic.

Moist, stony, shady places in limestone woods and among debris in the Alps and sub-Alps; local. June to August.

Distribution.—Carpathians, Silesian Mountains; Eastern, Central, and Western Alps, Jura, Pyrenees.

Bartsia alpina L.

Rhizome branching, many-stemmed. Stem simple, erect, or ascending, purplish brown, with glandular hairs, 2–8 inches high, quadrangular, scaly at the base. Leaves opposite, ovate, somewhat amplexicaul, bluntly serrate, wrinkled, covered with short hairs; upper leaves violet. Flowers solitary in the axils of the upper leaves, shortly stalked, dark violet-red, covered with glandular hairs. Anthers bearded. Calyx hairy. Becomes black on drying.

Fresh, grassy places in the Alps and sub-Alps, extending upwards to 8800 feet. July, August.

Distribution.—Carpathians, Sudetic Mountains, Eastern, Central, and Western Alps, Jura, Vosges, Black Forest, Pyrenees. All mountainous Europe, and as far as Arctic Russia and Siberia. (British.)

VERONICA L. (Speedwell)

Herbs with opposite stem-leaves and small flowers, blue, white, or pink, in spikes or racemes, or in the axils of alternate floral leaves. Calyx 4 or rarely 5-cleft. Corolla with very short tube, and rotate limb, deeply 4-cleft. Stamens 2. Capsule more or less flattened laterally, and opening in 2 valves. Seeds few.

A large genus in the northern hemisphere; a few species extending into the tropics and southern hemisphere, and others (mostly shrubs) are peculiar to New Zealand and Australia.

Veronica urticæfolia Jacq.

Stem erect, roundish, 10–16 inches high, hairy like the leaves. Leaves sessile, ovate, acute from a cordate base; upper ones acuminate, all sharply serrate, entire at the base. Racemes opposite, loose. Peduncle shorter than the leaf. Pedicels erect, usually longer than the linear-lanceolate bracts, patent when fruit is ripe. Flowers pale pink. Capsule erect, compressed, nearly globular, slightly emarginate, twice as long as the calyx.

Woody declivities and woods in the Alps and lower Alps. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Pyrenees, Jura; Central and Southern Europe from Spain to Turkey.

Veronica Allionii Vill.

Stem creeping and then ascending, woody at the base and very

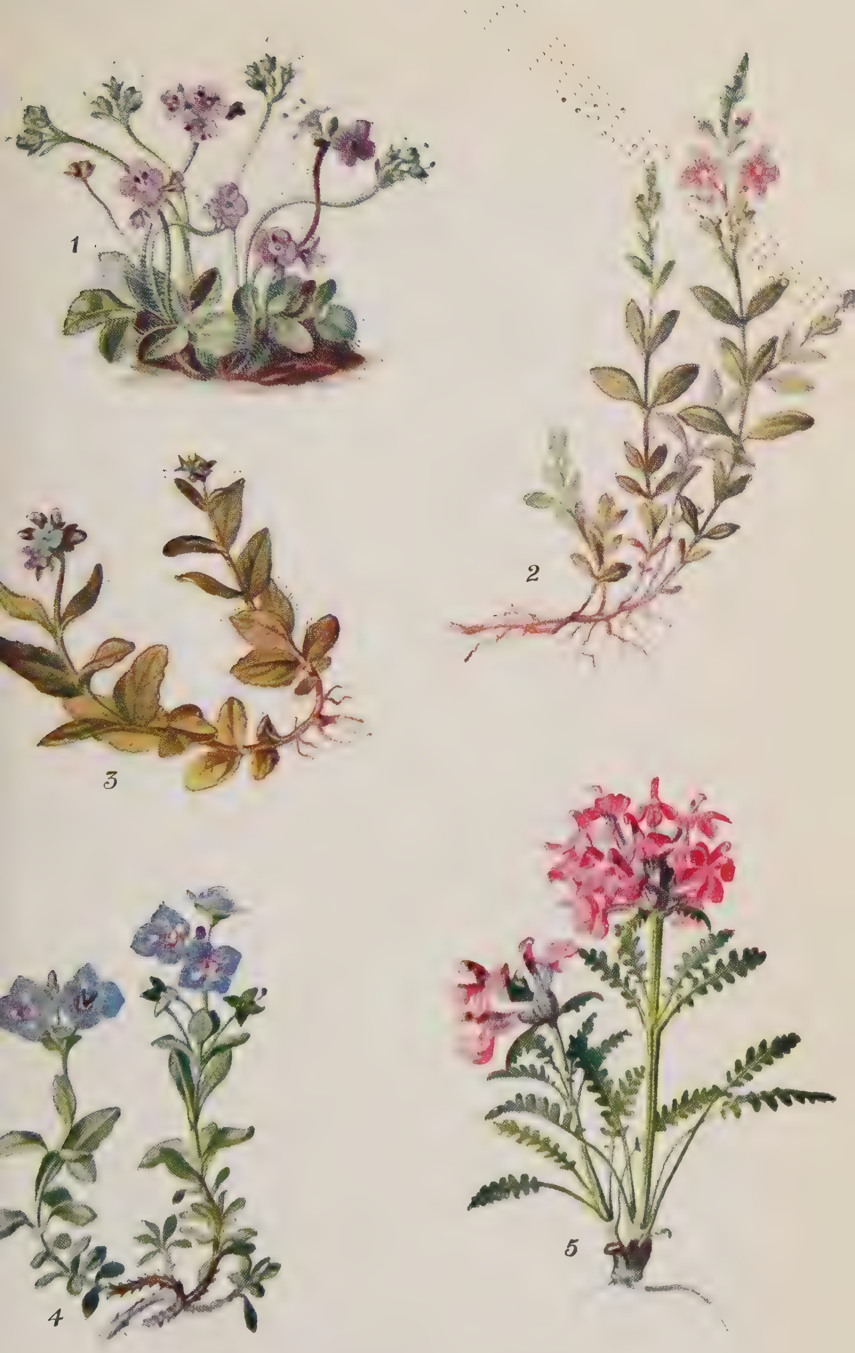

PLATE LV.

1. Veronica aphylla L.
2. Veronica fruticulosa L.
3. Veronica alpina L.
4. Veronica saxatilis Scop.
5. Pedicularis verticillata L.

leafy. Leaves opposite, small, oval, close together, entire or finely crenate, coriaceous. Flowers dark blue, numerous, in a dense spike on a thick and downy, naked axillary peduncle. Calyx hairy, with 4 linear lobes. Corolla 4 times as long as the calyx. Style longer than the capsule, which is oboval, compressed, very slightly emarginate, and scarcely exceeding the calyx.

Dry, stony pastures in the Alps, 6000–8800 feet; local. July, August.

Distribution.—Western Alps of Savoy, Dauphiny, Provence, and Piedmont. Abundant at Mont Cenis, and observed by the writer as high as 2745 metres (9000 feet) on the Goléon in Dauphiny, on which peak a rose-coloured specimen was also found.

Veronica aphylla L. (Plate LV.)

Stem naked, 1–2 inches high; runners creeping, few-leaved, hairy. Leaves ovate or obovate, crenate-serrate or nearly entire, obtuse, with very short leaf-stalk, crowded almost into rosettes. Flowers pale blue or mauve, very fugitive, in a single axillary or apparently terminal, long-stalked, few-flowered, glandular, corymbose raceme, which is elongated when the fruit is ripe. Flower-stalks erect in fruit, longer than the capsule. Capsule oval or obovate, emarginate, longer than the 4-cleft calyx.

Rocky, moist places on the high Alps up to 9000 feet, and not descending to the subalpine regions. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Pyrenees, Caucasus, Altai, North America.

Veronica fruticulosa (L.) Wulf. (Plate LV.)

Stem woody below and procumbent, rooting, annual shoots 6–9 inches high. Leaves opposite, glabrous, fleshy, crowded with weak hairs on the margin; upper leaves lanceolate, obtuse, sessile, entire or crenate; lower leaves smaller, narrowed into a short leaf-stalk. Raceme terminal, at length elongated. Flowers pink or rose, veined with a darker tint. Capsule roundish ovate, compressed, hairy towards apex, as long as the calyx. Style as long as the capsule. Distinguished from the nearly allied *V. saxatilis* L. by the glandular hairs, red flowers, and the longer leaves.

Stony Alpine and subalpine places up to 8000 feet; local. June to August.

Distribution.—Eastern, Central, and Western Alps, Southern Jura, Pyrenees, Sierra Nevada. Rare in Switzerland except on the Jura (Dôle) and about Engelberg, on limestone.

Veronica saxatilis Scop. (*V. fruticans* Jacq.). (Plate LV.)

Stem 2–6 inches high, ascending from a woody base. Leaves oblong-lanceolate or oval, obtuse, entire or slightly crenate, thick, coriaceous; lower leaves smaller. Inflorescence covered with very short, curved glandular hairs. Flowers large, handsome, blue with a red ring at the throat. Capsule longer than the calyx, ovoid, and slightly conical. Style at least as long as the capsule. A very variable species, according to situation, soil, etc. It possesses a strong dye, which is such that a dried specimen in the herbarium frequently makes an exact impression on the sheet of that above it.

Stony places in the Alps and sub-Alps. June to August or September. Prefers granite.

Distribution.—Carpathians, Sudetic Mountains, Eastern, Central, and Western Alps; Vosges, Jura, Auvergne, Pyrenees, Corsica. Rare in Scotland. Scandinavia.

Veronica alpina L. (Plate LV.)

Rootstock creeping, with simple stems, 2–6 inches high. Leaves elliptical, acute or obtuse, crenate or entire. Flowers in a corymbose raceme, nodding, and at length elongated, with from 6 to 8 small, stalked blue flowers with short corolla-tube. Flower-stalks shorter than the calyx. Inflorescence and calyx profusely covered with long hairs. Capsule longer than calyx, turgid, somewhat emarginate. Style about half length of capsule. A variable species.

Alpine pastures, and bare, stony places just below the snow-line, 6500–9200 feet. July, August.

Distribution.—Carpathians, Riesengebirge, Eastern, Central, and Western Alps; Jura, Corsica, Pyrenees. High mountains of Europe as far north as Lapland. (Rare in Britain.)

Veronica bellidioides L.

Much like the last but larger in all its parts, though intermediate forms appear to occur. Stem 4–6 inches high, simple, ascending, rough-haired like the entire plant, glandular above. Leaves light green, hairy, obovate-lanceolate, obtuse, entire or crenate; the lowermost much larger, narrowed into a leaf-stalk, and crowded almost into rosettes, persistent; upper leaves sessile, distant. Flowers in a roundish, crowded spike, elongated and looser when in fruit. Flowers dull blue. Capsule oval or ovoid, slightly emarginate. Seeds flat.

Alpine and subalpine pastures and stony places. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees, Moravia, Transylvania, North-east Balkans.

Veronica lilacina Townsend (1877) (*V. Townsendi* Gremli.).

Closely resembles the last, of which it may be considered a sub-species. The whole plant is very glandular. The flowers are lilac or violet in colour, the stem-leaves are larger, and the capsule more conical. Anthers nearly white, instead of being yellow.

It was first found in the Valais by the late Mr. Townsend, and described in the *Journal of Botany*, but has since been recorded from the Pyrenees and Corbières.

Veronica spicata L.

Is often seen in the Alpine zone, though more frequently in the sub-Alps and plains. We have seen it as high as 8500 feet on one of the frontier Cols near Mont Cenis, and a white form in the same district.

The best of the Alpine Veronicas for cultivating are *V. Allionii* and *V. saxatilis*. They both like sun and a very gritty, sandy compost in a well-drained position.

EUPHRASIA L.

There are many of these pretty little plants (Eyebrights) in the Alps, but it does not come within the scope of this work to enter seriously into so critical a genus. The more distinct Alpine species are *E. salisburgensis* Funck, with very prominent, sharp teeth to the leaves, *E. alpina* Lam., *E. Rostkoviana* Heyne, and *E. minima* Jacq., with small yellow flowers, which has recently been discovered in several places on Exmoor, as an addition to the British flora.

Rhinanthus is another difficult genus, not yet thoroughly understood, which comprises several species seen in the Alps and sub-Alps, and often in great quantities in the mowing grass. Two or three kinds are very common at about 5000 and 6000 feet.

PEDICULARIS L.

Flowers usually in bracteate spikes or racemes, large and showy, red or yellow. Calyx tubular or campanulate, often inflated, 2–5 toothed. Corolla 2-lipped, tube often dilated, upper lip entire or notched, lower lip 3-lobed. Stamens 4. Anthers hairy. Erect herbs, with deeply divided leaves, turning black when dry, parasitic upon roots.

There are about 150 species inhabiting the mountainous parts of Europe, Asia, Africa, and America. Many are acrid, and consequently harmful to the pastures.

Pedicularis acaulis Scop. (Plate LVI.)

Scape wanting. Flower-stalks radical, and 1-flowered, woolly. Leaves bipinnate, 3–6 inches long, standing in a radical whorl. Calyx-teeth leaf-like above. Upper lip of corolla sickle-shaped, woolly at the base. Flowers pale red, large.

Moist Alpine declivities and pastures. May, June.

Distribution.—Eastern Alps from Tyrol to Carniola.

Pedicularis verticillata L. (Plate LV.) (Whorled Lousewort).

Stems erect or ascending, several from the same crown, simple, leafy, nearly glabrous, or with 4 rows of hairs. Leaves pinnate or pinnatifid, with narrow, unequally serrate segments; stem-leaves opposite, or in whorls of 3 or 4. Flowers in a crowded terminal, whorled spike, leafy at the base. Calyx ovate, inflated, with long hairs on the nerves, obliquely truncate, 5-toothed, upper lip short. Corolla glabrous, rose to purple, upper lip not beaked. Capsule ovate-lanceolate, with an acute apex, glabrous, at least twice as long as the calyx.

Alpine pastures, especially in rather damp places. June to August.

Distribution.—Carpathians; Eastern, Central, and Western Alps, Pyrenees, Sierra Nevada; Europe, Asia, North America.

Pedicularis incarnata L. (*P. rostrato-spicata* Crantz). (Plate LVI.)

Stem erect, 6–18 inches high, simple, leafy, glabrous like the leaves, much longer than the radical leaves. Leaves pinnatifid, lobes lanceolate in outline, inciso-serrate, thin at the margin or at all events not encrusted. Flowers in a terminal elongated, loose spike, leafy at the base. Calyx tubular-campanulate, woolly like the bracts, 5-cleft; teeth lanceolate, straight, usually entire, very unequal. Corolla bright rose-colour, beak darker red, upper lip contracted into a straight linear beak, lower lip not ciliated. Capsule obliquely ovate, mucronate, glabrous, rather longer than the calyx.

Alpine pastures up to 8000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps.

Pedicularis gyroflexa Gaudin non Vill. (*P. fasciculata* Bellardi). See Koch *Synopsis*, Ed. 2, p. 622.

Stem 8–10 inches high, covered with short hairs, leaves large, bipinnatifid, with short rachis and inciso-serrate segments. Flowers rose-coloured, large, 8–15 in a head or spike. Calyx woolly, with pinnatifid, leaf-like divisions. Upper lip of corolla with a short conical beak (2 mm.), lower lip small. Capsule equalling the calyx or slightly exceeding it.

Pastures of the Alps up to 8200 feet; very local or rare. June to August.

Distribution.—Southern Tyrol, Southern Switzerland, and Western Alps.

The nomenclature of this species has been much confused, *P. gyroflexa* Vill. having been confounded with it.

Pedicularis cenisia Gaudin.

Smaller than the last and always woolly. Leaves bipinnatifid, with narrow rachis and woolly petiole, and finely toothed lobes. Calyx tubular-campanulate, woolly, 5-cleft, with lanceolate, acute, toothed lobes. Upper bracts trifid, with entire lobes. Flowers bright rose-coloured, filaments glabrous. Upper lip suddenly contracted into a long linear beak (4 mm.). Capsule ovate, acuminate, longer than calyx.

Alpine pastures up to 8000 feet. July, August.

Distribution.—Western Alps of France and Piedmont; not nearer Switzerland than the Aosta Valley and Cogne Valley.

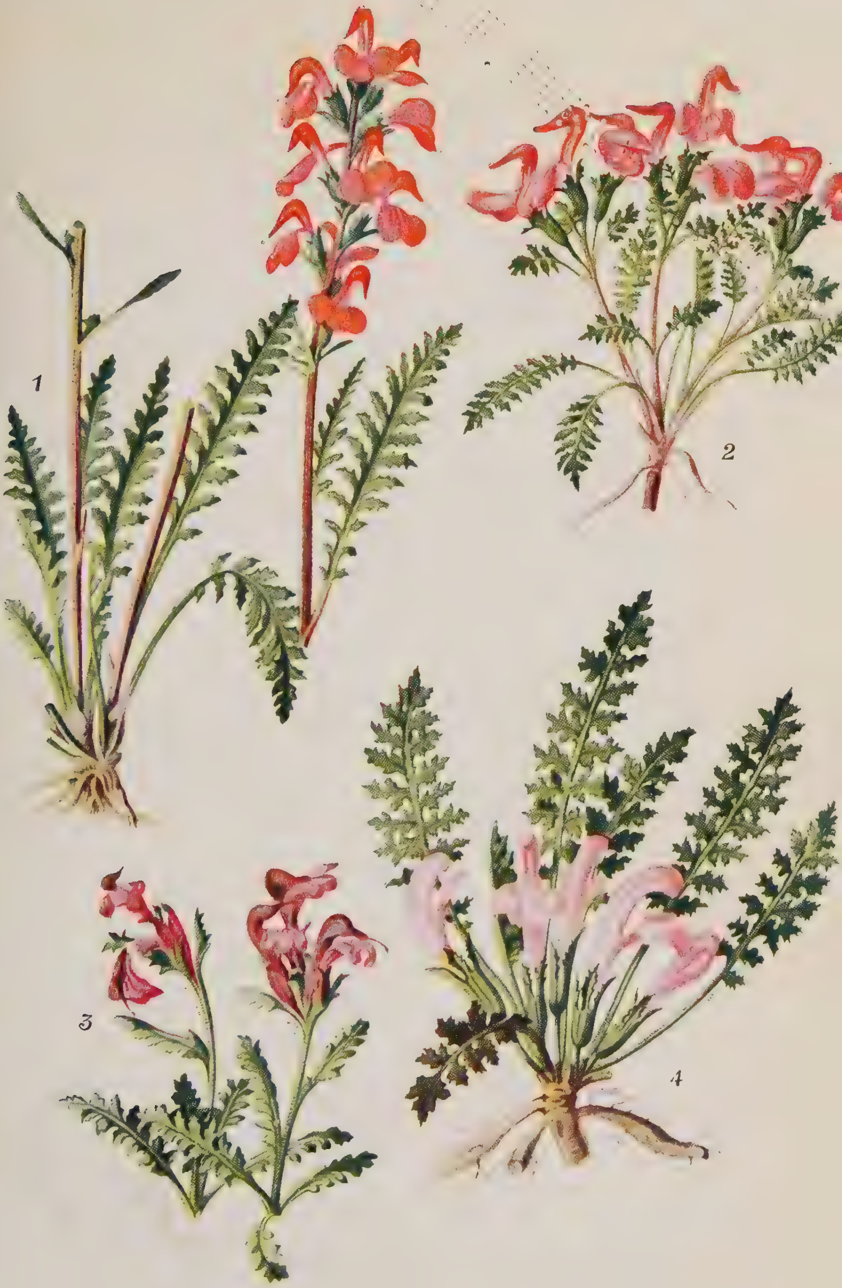

PLATE LVI.

1. Pedicularis incarnata Jacq.
2. Pedicularis rostrata L.
3. Pedicularis asplenifolia Floerke.
4. Pedicularis acaulis Scop.

Bentham in DC. *Prodromus* wrongly put this with *P. rostrata* L.

The somewhat similar species, *P. mixta* Gren. and *P. pyrenaica* Gay are special to the Pyrenees.

Pedicularis rostrata L. (Plate LVI.)

Stem prostrate, then ascending, 2–4 inches high. Leaves pinnate, pinnæ biserrate. Calyx tubular, narrowed at the base, shortly villose, lobes leaf-like at the apex, unequally crenate, bent into a hook at the apex, one-third the length of the calyx-tube. Corolla a beautiful rose-red, beak darker. Longer stamens bearded above the middle; hair-line of stem villose. Beak prominent.

Rocky Alpine pastures and glacier moraines. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Pyrenees.

Pedicularis asplenifolia Floerke. (Plate LVI.)

Stem 1–3 inches high, with a short 3–6 flowered spike and rose-red flowers. Leaves lanceolate, pinnate, pinnæ doubly serrate. Spike loose, few-flowered. Calyx-segments toothed. Upper lip of corolla prolonged into an elongated straight or slightly-curved beak, sharply truncate at the apex.

Moist, shady places in the Alps, 6500–8300 feet. July, August.

Distribution.—Eastern and Central Alps, but rare, and only in Grisons in Switzerland, near the Tyrolese frontier.

Pedicularis Jacquini Koch (*P. rostrato capitata* Crantz). (Plate LVII.)

Stem 1–4 inches high, ascending, leafy, with 1 or 2 rows of hairs, rather longer than the radical leaves. Leaves glabrous, doubly pinnatifid, dull green, often streaked with purple and with a white incrustation at the margin. Segments elliptical or lanceolate, serrulate or entire. Flowers in a terminal 3–15 flowered corymbose raceme, leafy at the base. Calyx tubular-campanulate, mostly glabrous, 5-cleft; segments foliaceous, unequally crenate, recurved at apex. Upper lip of corolla contracted into a straight linear-conical beak, lower lip shortly ciliate. Capsule semi-ovoid, lanceolate, narrowed into a fine oblique beak, glaucous, longer than the calyx. Corolla about 1 inch long, flesh-coloured or purple; beak purplish brown.

Alpine pastures and rocky places. June, July.

Distribution.—Eastern and Central Alps. In Grisons only in Switzerland, on the borders of Tyrol.

Pedicularis Portenschlagii Sauter.

Stem simple, leafy, 3–4 inches high, with 1 or 2 rows of hairs, otherwise glabrous. Leaves glabrous, pinnatifid, lobes linear-lanceolate, unequally serrate, dull green in colour. Flowers in a terminal 1–5 flowered raceme, leafy at the base. Calyx tubular-campanulate, glabrous, 5-cleft, segments unequally crenate, recurved at apex. Upper lip of corolla prolonged into a short conical beak. Capsule linear-lanceolate, mucronate, glabrous, longer than calyx. Corolla handsome, flesh-coloured or purple.

Meadows and stony places in the calcareous Alps. June, August.

Distribution.—Carpathians, Eastern and Central Alps, but not in Switzerland.

Pedicularis rosea Jacq. (Plate LVII.)

Stem erect, simple, 1–3 leaved or leafless, often reddish, glabrous below like the leaves, covered with white wool in upper part like the bracts and calyx. Leaves pinnate; pinnæ linear, unequally serrate or almost pinnatifid. Flowers in a terminal crowded, capitate spike, leafy at base. Calyx tubular, 5-cleft; teeth lanceolate, entire, equal in length. Corolla glabrous, upper lip not beaked; corolla rose-coloured, upper lip darker. Capsule ovate, mucronate, glabrous, longer than calyx.

Pastures on calcareous Alps up to 2680 metres. June to August.

Distribution.—Eastern and Western Alps.

Pedicularis recutita L.

Rootstock almost tuberous, with thick fibres. Stem erect, 1–2 feet high, simple, leafy, glabrous like the entire plant, or downy in the angles. Leaves pinnatifid, segments lanceolate, inciso-serrate. Flowers in a terminal, crowded, at length, elongated cylindrical spike, leafy at base. Calyx campanulate, 5-cleft; teeth lanceolate, entire, ciliated. Corolla glabrous, upper lip not beaked. Flowers dull greenish red, and withering quickly. Capsule ovate, mucronate, glabrous, somewhat longer than the calyx.

Distribution.—Carpathians, Eastern, Central, and Western Alps. Damp and shady Alpine and subalpine places. June, July.

Pedicularis elongata Kerner. (Plate LVII.)

Flowers yellow. Raceme many-flowered, elongated, narrowed towards apex. Stem with 2 or 3 lines of hairs. Bracts glabrous, 3-nerved. Leaves deeply pinnatifid, segments inciso-serrate. Calyx campanulate, 5-cleft, teeth unequal, end of the shorter one narrowly lanceolate, the rest leaf-like, incised, broader, downy within, ciliate. Upper lip of corolla drawn out into a slender beak, darker yellow than the lower. Capsule ovate, obliquely acuminate, scarcely longer than the calyx.

Alpine and subalpine meadows in South-eastern Tyrol and the Venetian Alps. July, August.

Pedicularis tuberosa L.

Flowers pale yellow. Root short, almost tuberous. Stem about 8 inches high, densely woolly. Leaves bipinnatifid, with toothed lobes and woolly petiole. Upper bracts trifid. Calyx

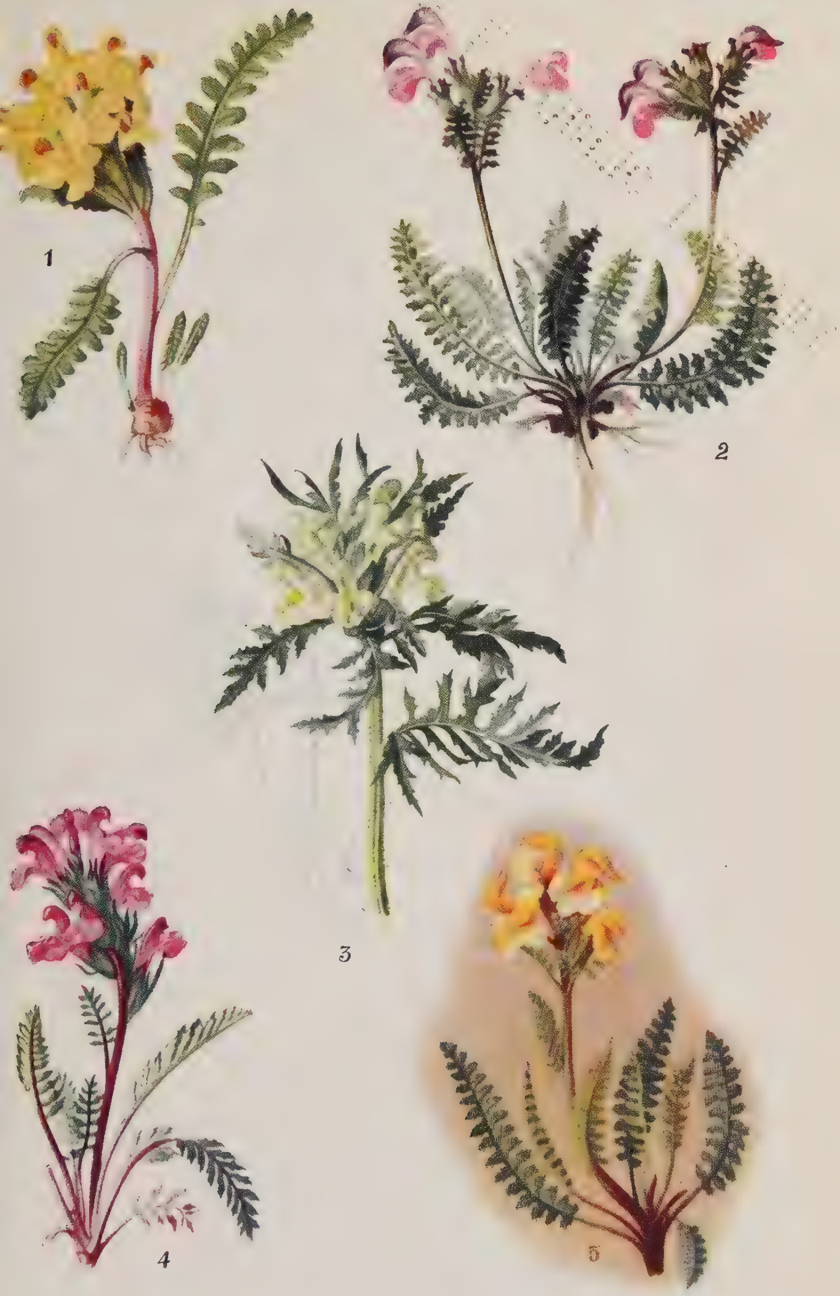

PLATE LVII.

1. Pedicularis Œderi Vahl.
2. Pedicularis Jacquinii Koch.
3. Pedicularis foliosa L.
4. Pedicularis rosea Jacq
5. Pedicularis elongata Kern.

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campanulate, cleft to the middle in 5 foliaceous teeth, almost enclosing the capsule, which has a mucronate apex. Filaments longly-bearded. Corolla glabrous, upper lip ending in a short beak. Flowering-spike short.

Alpine pastures; local. June to August.

Distribution.—Eastern, Central, and Western Alps from Savoy to Provence; Pyrenees, Apennines.

Pedicularis Barrelieri Reichb.

Somewhat like the last, but less hirsute and with a more elongated and tapering spike, clear yellow flowers, and calyx teeth, which are not foliaceous, but merely indented or sometimes entire.

Limestone Alpine pastures above 5600 feet; rare.

Distribution.—Western Switzerland, Isère, Savoy, Haute-Savoie, Piedmont.

Pedicularis Oederi Vahl. (Plate LVII.)

Stem scarcely 3 inches high, erect, simple, leafy. Leaves pinnatifid, segments blunt, obscurely serrate. Calyx-tube cylindrical, hairy, teeth rhomboidal at the apex, serrate; the posterior tooth triangular, acute. Corolla-tube long, almost closed; upper lip twice curved at the back, without beak; lower lip 3-cleft, lateral divisions cordate-ovate. Capsule with a long curved beak at the apex. Raceme short, crowded. Flowers yellow, red-brown on the under side of upper lip.

Damp limestone rocks and other damp places in the Alps; local. June, July.

Distribution.—Carpathians, Eastern and Central Alps (northern chain only in Switzerland).

Pedicularis comosa L.

A leafy plant, 1 to 2 feet high, and rough with woolly hairs. Flowers yellow. Leaves pinnate, pinnæ long, acuminate, deeply pinnatifid, serrate, teeth apiculate. Calyx 5-toothed, somewhat downy on the edges, teeth very short, ovate, obtuse, broader than long. Upper lip of corolla sickle-shaped, shortly beaked; beak truncate, widened at the 2 edges into a trigonous subulate tooth, glabrous.

Alpine pastures and steep escarpments; rare. June to August.

Distribution.—Southern Tyrol, Western Alps (including Savoy and Liguria), Cevennes, Auvergne, Pyrenees, Corsica, Northern Asia.

Pedicularis foliosa L. (Plate LVII.)

A tall, leafy species, 1 to 2 feet high, nearly glabrous. Stem erect, simple, very leafy above, nearly glabrous. Leaves pinnatifid, glabrous above, with a few scattered hairs beneath; stem-leaves alternate, segments linear-lanceolate, pinnatifid, serrate or incised.

Flowers in a terminal crowded, leafy spike. Calyx tubular, villous on the nerves, unequally 5-toothed. Upper lip of corolla villous, not beaked. Flowers sulphur-yellow. Capsule ovate, mucronate, somewhat longer than the calyx.

Alpine and subalpine pastures and limestone escarpments. June to August.

Distribution.—Eastern, Central, and Western Alps; Vosges, Jura, Auvergne, Pyrenees, Apennines.

Pedicularis Friederici Augusti Tomm.

This plant, about 10 inches high, has pale greenish yellow flowers and long-stalked pinnate leaves. It is found in subalpine meadows on Mont Slavink above Prewald, towards Görz in the Eastern Alps.

Melampyrum L.

This is another, but very small genus of plants parasitic upon roots, several of which species are common in Alpine and subalpine woods.

The Cow-wheats have bright yellow flowers, and one species, *M. nemorosum* L., is conspicuous with its violet-coloured bracts, which with the yellow and orange blossoms make it an attractive object in many mountain woods. Its leaves are broader than in any other species, being ovate-lanceolate, with a sagittate base. *M. sylvaticum* L. is very common in mountain woods, on limestone, up to 6500 feet, and *M. pratense* L. is abundant in woods and pastures even higher.

LENTIBULARIACEÆ

A family of marsh or aquatic plants, and very few genera, dispersed over the greater part of the globe.

Pinguicula L.

Small insectivorous plants growing in bogs or on wet rocks, with radical, entire leaves, yellow or purple flowers on leafless, radical peduncles. Corolla spurred, with a broad, open mouth. Capsule opening in 2 or 4 valves.

Pinguicula alpina L. (Plate LVIII.) (Alpine Butterwort.)

Leaves in radical rosettes, lanceolate or obovate, obtuse, entire, with revolute margins, thick and covered with viscid hairs like the whole plant. Stem erect, leafless, 1-flowered. Corolla pendent, creamy white, often with citron-yellow spots on the central lobe and the apex of the spur, which is gibbous and shorter than the corolla.

Wet rocks and stony pastures, and in damp, mossy Alpine and subalpine places. Blossoms from the melting of the snow till July.

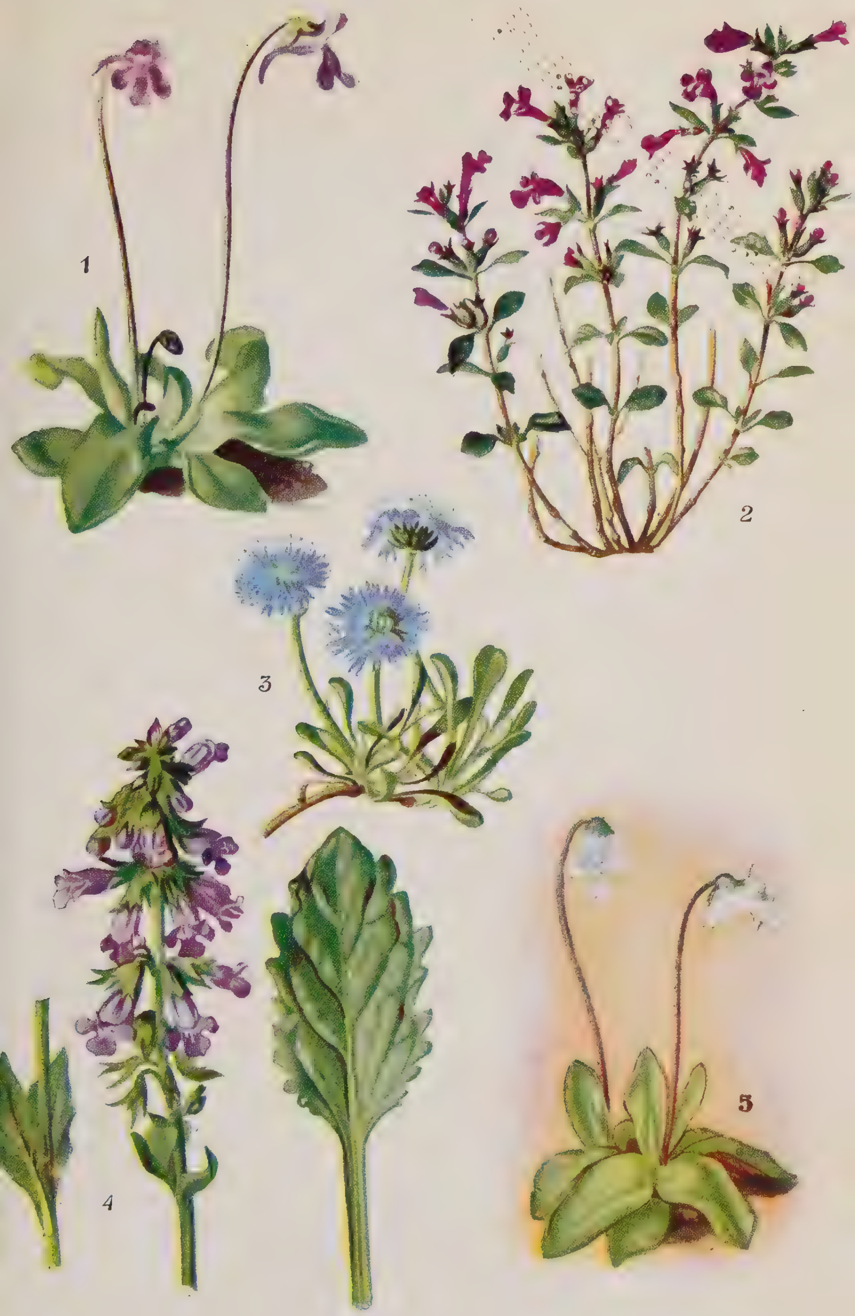

PLATE LVIII.

1. Pinguicula vulgaris L.
2. Calamintha alpina Lam.
3. Globularia cordifolia L.
4. Horminum pyrenaicum L.
5. Pinguicula alpina L.

Distribution.—Mountain ranges of Central Europe and Russian Asia, and Arctic Europe and Asia. (British.)

Pinguicula vulgaris L. (Plate LVIII.)

Leaves in radical rosettes, similar to the last, but larger. Spur of corolla subulate, slender, about half the length of the corolla. Flowers violet, larger than in *alpina.*

Wet rocks and damp places, ascending to 6500 feet, but not a truly Alpine plant. May to July.

Distribution.—Europe and all round the Arctic Circle, and Russian Asia and North America. (British.)

Pinguicula grandiflora Lamk.

This large-flowered species, well known in Western Ireland, is found in many of the mountain chains of Europe, especially the Jura, Western Alps, and Pyrenees, but in Switzerland only on some of the Jura frontier peaks. A sub-species called *P. Reuteri* Genty is found in the Southern Jura and Western Alps. Dead flies, more or less absorbed, are frequently seen on the sticky leaves of all the Pinguiculas.

GLOBULARIACEÆ

A small family of about 14 species, inhabiting Europe and the Mediterranean district.

Globularia L.

Flowers blue, in globular heads. Corolla tubular. Calyx 4-cleft, teeth linear. Stamens nearly equal in length. Stigma simple, capitate.

Globularia cordifolia L. (Plate LVIII.)

Root tapering, branched, putting up branching prostrate, rooting shoots, which ultimately become woody and knotty. Stem herbaceous, erect or ascending, simple, leafless except for 1 or 2 scales, glabrous like the leaves. Flowers blue, in a solitary umbel, flatly hemispherical. Leaves of the shoots alternate, crowded, stalked, obovate-lanceolate or spathulate, entire, rounded at the apex, emarginate or 3-toothed.

Gravelly, stony, and dry Alpine and subalpine places, often covering large tracts. May to July.

It prefers limestone, and is found from the plains up to 8000 feet.

Distribution.—Eastern, Central, and Western Alps; Jura, Pyrenees, Central and Southern Europe.

Globularia nudicaulis L.

Rootstock with fusiform branches, many-headed, but with no runners. Stem herbaceous, 3–6 inches high, or with a few scales, naked, erect, simple, glabrous like the leaves, bearing only a single hemispherical capitulum of blue flowers. Radical leaves, stalked, cuneate-oblong, entire, rounded at the apex or shallowly emarginate. Scales of the stem small, lanceolate-membranous, not ciliated. Leaves coriaceous, dark green.

Pastures and stony places on the calcareous Alps and lower Alps. June, July. It does not reach quite so high an altitude as the last.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Spain, Apennines.

LABIATÆ

Herbs, or rarely shrubs, with square stems and opposite leaves, often glandular and fragrant. Flowers solitary or in opposite, axillary, crowded, stalked or sessile cymes. Corolla tubular and 2-lipped. Calyx persistent, 5-cleft. Stamens 4, epipetalous, rarely 2. Ovary 4-lobed, with 1 ovule in each lobe. Stigma 2-fid. Fruit of four 1-seeded nutlets.

A very large family, spread all over the globe, and easily known from all other Monopetals, except the Borage family, by the 4-lobed ovary and the 4 small nuts in the base of the calyx. The family, however, comprises comparatively few Alpine species, and not one high 'Alpine.'

Calamintha alpina Lam. (*Satureia alpina* Scheele). (Plate LVIII.)

Stem prostrate or ascending, about 6 inches high, simple or branched, downy like the calyx. Leaves ovate or elliptical, acute, slightly serrate, glabrous. Flowers reddish violet, in few-flowered, distant false whorls (axillary cymes). Calyx open in fruit, with spreading teeth, and clearly 2-lipped.

Sunny, stony Alpine and subalpine slopes, descending into the plains, and sometimes seen at 8000 feet; a lover of lime; very common. June to August.

Distribution.—Carpathians, Eastern, Central, and Western Alps, Jura, Pyrenees.

Though somewhat straggling, this might be more cultivated for its beautiful rich colour. It is certainly more than a 'weed.'

Horminum pyrenaicum L. (Plate LVIII.)

About 6 or 10 inches high. Root-leaves stalked, ovate-lanceolate, crenate, wrinkled, glabrous. Flowers violet, usually in false whorls (axillary cymes) of 6. Calyx 2-lipped, upper lip 3-toothed; lateral teeth wedge-shaped. Corolla 2-lipped, upper lip erect, 2-cleft, tube provided with a ring of hairs. Stamens 4, distant, connivent towards the apex beneath the upper lip of corolla. Anthers coherent in pairs; anther-lobes coalescent at the apex, dehiscing by a common longitudinal fissure. It is the only species known.

Grassy pastures in the Alps from about 4000–6500 feet; very local, and absent from many large districts. June to August.

Distribution.—Eastern, Central, and Western Alps, but extremely rare in the Western Alps and in Western Switzerland; Pyrenees.

This plant frequently figures in nurserymen's catalogues, perhaps because it is one of the very few Alpine Labiates worth cultivating. It grows best on a level spot, and requires some lime.

Horminum is so local and yet widely spread that the writer, who has travelled far and wide in the Alps, can only remember having seen it once, viz. above Bormio in walking over the Stelvio Pass.

Betonica Alopecurus L. (Plate LIX.)

Stem 8–20 inches high, erect, simple, few-leaved, rough-haired like the entire plant. Leaves stalked, ovate or cordate-ovate, acute or obtuse, coarsely crenate or dentate. Flowers yellowish white, in axillary cymes, collected into a dense, pseudo-verticillate, capitate or sometimes uninterrupted spike. Calyx as long as the corolla-tube, with sharp teeth one-third length of the calyx-tube.

Alpine and subalpine pastures. July, August.

Distribution.—Carpathians; Eastern, Central, and Western Alps, Pyrenees.

Betonica hirsuta L.

Stem 6–12 inches high, erect, leafy, and hairy like the whole plant. Leaves cordate-elliptical, blunt or acute, coarsely crenate, lower ones stalked, upper pair sessile and turned downwards. Flowers dark rose, in axillary cymes collected into an oval, compact spike. Calyx 12–15 mm. long, with lanceolate-acute teeth one-third its length.

Alpine and subalpine pastures up to 8200 feet; local. July to September.

Distribution.—Eastern, Central, and Western Alps, Pyrenees, Spain.

Dracocephalum Ruyschianum L. (Plate LIX.)

Stem 8–12 inches high, erect or ascending, branched, nearly glabrous, very leafy. Leaves linear-lanceolate, entire, green and shining above, paler beneath and dotted, margin somewhat recurved. Inflorescence spicate. Bracts broad, lanceolate-ciliate. Flowers violet-blue, handsome.

Pastures and stony places in the Alps; rare. July, August.

Distribution.—Central and Western Alps; Central Pyrenees, parts of Germany; also Asia and Japan.

Scutellaria alpina L. (Plate LIX.)

Stem procumbent and ascending, 4–8 inches high, leafy and branched. Leaves ovate, crenate-serrate; lower leaves stalked; upper leaves sessile, more or less hairy like the flowers and stems. Flowers in a more or less quadrangular spike, with membranous, imbricate bracts which vary in colour like the flowers (being not always green); flowers mauve or bluish purple, with the lower lip whitish; sometimes purple, red, or white, and the lower lip tinted accordingly. Upper lip of corolla trifid, lower lip undivided, large. Calyx very small.

Dry, stony places in the Alps and lower Alps, chiefly on limestone; local. June to August.

Distribution.—Carpathians, Western Switzerland, Western Alps, Cevennes, Pyrenees, Siberia.

The colour of the flowers is extremely variable, and they often vary even on the same plant. See note by H. S. T. in *Journal of Botany*, September, 1907.

Ajuga pyramidalis L. (Plate LIX.)

Stem 3–12 inches high, densely leafy, erect, simple, woolly. Leaves decreasing in size upwards, the lowermost very large. Leaves obovate-lanceolate or oblong, obtuse, slightly serrate, wavy or entire, more or less pilose like the bracts; lower leaves narrowed into a leaf-stalk; upper leaves sessile, passing into ovate, often obscurely 3-lobed bracts, even the uppermost bracts twice as long as the flowers. Bracts often with a violet tinge. Flowers pale azure-blue, collected into whorls towards the summit of crowded spikes.

Pastures and Alpine woods up to 7000 feet. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Black Forest, Vosges, Pyrenees, Caucasus, Central and Northern Europe; Altai. (British.)

Ajuga genevensis L.

Is not an Alpine plant, being found in limestone woods and on banks, etc., in the plains and hills; but we mention it here because it is well worth cultivating in gardens; the flowers are an exquisite and very deep blue. It is much more elegant than *A. pyramidalis.*

Salvia pratensis L.

No book on Alpine plants should fail to mention this very common but extremely beautiful plant, for, though not strictly Alpine, for it grows throughout the plains of Europe, it is particularly abundant in Alpine meadows and pastures, and gives quite a purple glow to many a mountain-side before the grass has been cut. It is variable both in size and colour, as well as in the shape of its leaves. Few of the larger plants in the Alps are so useful for making bouquets as this. The colour varies from mauve to violet-blue.

Hyssopus officinalis L.

Is another beautiful blue Labiate, which is by no means Alpine, though sometimes it adorns hot limestone rocks and slopes 3000 or 4000 feet above the sea, as e.g. on the Great St. Bernard road above Orsières and below Lanslebourg in Savoy. It is not the Biblical Hyssop, and is not found in Palestine.

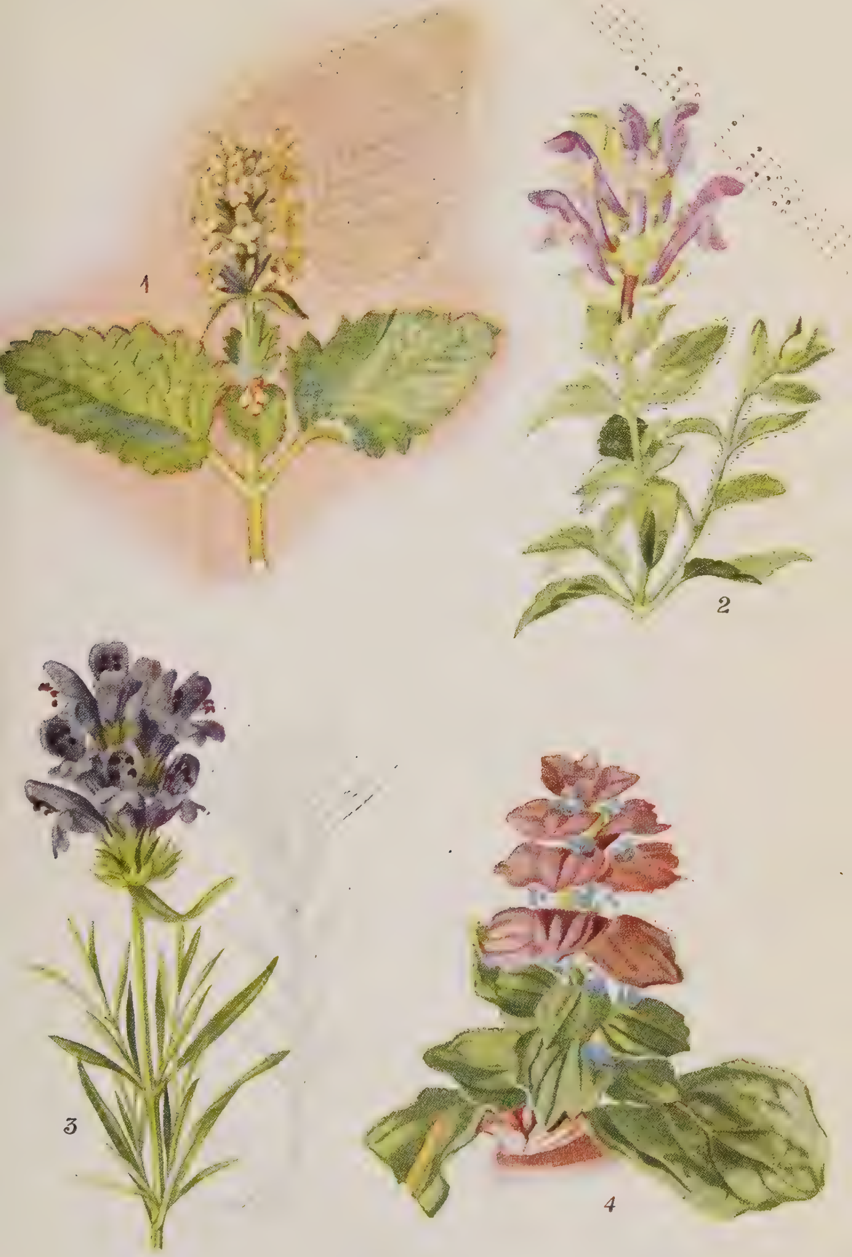

PLATE LIX.

1. Betonica Alopecurus L.
2. Scutellaria alpina L.
3. Dracocephalum Ruyschiana L.
4. Ajuga pyramidalis L.

THYMUS L.

Many species and varieties of Thyme grow in the high Alps and sub-Alps, and among them are *T. Chamædrys* L., *T. lanuginosus* M., *T. polytrichus* Kern., and *T. Serpyllum* L. The following varieties of *T. Serpyllum* have been found by the writer at Mont Cenis and in Dauphiny at heights varying from 7000–9000 feet. They were all determined by Dr. John Briquet of Geneva: *T. Serpyllum* L. var. *ovatus* Briq. (*T. montanus* W. and K.), in many places above 8000 feet; var. *subcitratus* Briq., var. *alpestris* Briq. (=*T. Chamædrys* var. *alpestris* Tausch.); var. *pachyderma* Briq., var. *vallesiacus* Briq. Most of these varieties are also found in Switzerland.

PLUMBAGINACEÆ

A small family extending over most parts of the world, but chiefly within the influence of the sea, or occasionally on high mountains (in *Armeria*).

ARMERIA L. (Thrift)

Flowers or naked scapes, collected into dense heads within an involucre of bracts. Calyx funnel-shaped, scarious. Leaves all radical, long and narrow.

Maritime or rarely Alpine perennial herbs.

Armeria alpina Willd. (*Statice montana* Miller). (Plate XLIV.)

Root cylindrical, tapering, tufted, with several crowns. Stem erect, simple, leafless, glabrous, 4–10 inches high, with a sheathing, scaly bract at the summit. Leaves radical, linear, obscurely 3-nerved, acute, glabrous. Flowers rose-coloured or pink in a large, terminal, handsome, hemispherical umbel, surrounded by a green involucre. Involucral bracts lanceolate, the outermost shortly awned. Calyx-limb shining, silver-white.

Rocks and stony pastures of the calcareous Alps, 6500–10,300 feet, but usually in the Western Alps at from 7000–9000 feet; local, but sometimes abundant, and rather rare in Switzerland. June to September.

Distribution.—Carpathians; Eastern Alps, Switzerland and Western Alps, Jura, Arctic Russia.

An article by the present writer on '*Armeria alpina* Willd. in Britain?' appeared in the *Journal of Botany*, November, 1910. He still believes the Mountain Thrift, common on some English, Scotch, Welsh, and Irish summits, is a form of *A. maritima*, and not *A. alpina*, as recently proposed by Mr. F. N. Williams in his *Prod. Fl. Brit.*

PLANTAGINACEÆ

Flowers small, green, in leafless, crowded spikes. Sepals 4, persistent. Corolla 4-lobed. Stamens 4, with large exserted anthers. Ovary free, 2–4 celled. Stigmas feathery.

PLANTAGO L. (Plantain)

Leaves all radical, with strong parallel ribs.

Plantago alpina L.

Root long and tapering, woody. Scape 6–9 inches long. Spike about 1 inch long. Leaves linear, 3-nerved, turning black when dry. Corolla-tube hairy.

Alpine and subalpine pastures up to 9000 feet. June to August.

Distribution.—Alps, Jura, Pyrenees, Spain, Bavaria.

A paper on 'A theoretical origin of *Plantago maritima* L. and *P. alpina* L. from *P. coronopus* L. vars.' was read by Professor Geo. Henslow before the Linnean Society, November 17th, 1910, in which he says that Hoffmann proved by experiment that *P. alpina* is identical with *P. maritima*.

Plantago montana Lam.

Leaves shorter than in *alpina*, linear-lanceolate and more spreading, 3–5 nerved, glabrous or slightly hairy. Spike few-flowered. Corolla-tube glabrous.

Alpine pastures up to 8500 feet. June to August.

Distribution.—Alps and Pyrenees.

Plantago fuscescens Jord.

Scape 8–10 inches high, covered with silky hairs like the whole plant. Spike many-flowered, with large oval-orbicular bracts. Corolla-tube glabrous. Leaves linear-lanceolate, acute, with 5–7 nerves, densely covered with silky hairs.

Alpine pastures from about 5600–7300 feet; very local.

Distribution.—Southern Tyrol (Monte Baldo) and Western Alps. Common in some of the Maritime and Ligurian Alps. Doubtfully recorded from two places in the Valais.

POLYGONACEÆ

Herbs with simple leaves and scarious, sheathing stipules (ochreæ). Flowers usually bisexual. Sepals 3–6, petaloid or green, often in 2 rows. Stamens 5–8. Ovary usually trigonous. Styles 1–3. Ovule solitary. Fruit hard, indehiscent, enclosed in the persistent perianth.

A considerable family, dispersed over the whole globe.

RUMEX L. (Dock)

A rather large genus spread (too widely) over the greater part of the world.

Rumex alpinus L.

This is the Dock so often seen in the neighbourhood of herdsmen's huts in Alpine pastures, sometimes up to nearly 8000 feet. The young stems when stewed afford a not unpleasant dish, resembling Rhubarb. The stems are 1–2 feet high, branched, glabrous like the whole plant. Leaves undulate, crenate, or entire, the lower ones cordate-orbicular or cordate-ovate, obtuse; higher ones ovate or ovate-lanceolate, acute, the uppermost lanceolate. Flowers in pseudo-verticillate, leafless, crowded racemes. The 3 inner valves of fruiting perianth cordate-ovate, reticulately veined, entire or serrate; none of them tubercled. Petioles long, channelled.

Damp alpine and subalpine pastures, generally near huts. July, August.

Distribution.—Carpathians, Riesengebirge, Eastern, Central, and Western Alps; Jura, Vosges, Black Forest, Auvergne, Pyrenees; Western Asia.

R. nivalis Hegets., *R. scutatus* L., and *R. arifolius* All. are also found in the Alps and sub-Alps, but less commonly.

Oxyria digyna (L.) Hill. (Plate LX.)

A small green, Dock-like plant about 4–6 inches high. Root-leaves reniform, on long stalks. Perianth 4-partite to the base, the inner teeth larger. Stamens 6, 2 opposite each of the outer, and 1 opposite each of the inner perianth teeth. Stigmas 2, penicillate. Flowers small, inconspicuous, greenish. Fruit winged, much larger than the mature perianth.

Rocks and debris in the Alps (chiefly granitic) up to 12,000 feet or higher. June to August. Found on the Grivola at 3800 metres (Vaccari).

Distribution.—Carpathians; Eastern, Central, and Western Alps; Pyrenees, Corsica; Europe, Asia, North America. (British.)

POLYGONUM L.

Herbs with alternate leaves and membranous stipules. Flowers bisexual, in terminal spikes or racemes. Sepals 5, usually petaloid. Stamens 5–8. Styles 2–3.

About 200 species distributed throughout the globe.

Polygonum viviparum L. (Plate LX.)

Stem 4–8 inches high, erect, simple, glabrous like the whole plant. Leaves entire, with recurved margin and crenate from the thickened transverse veins; lower leaves elliptical or lanceolate, contracted into a wingless leaf-stalk; upper ones lanceolate or linear-lanceolate, acute, sessile. Flowers in a linear-cylindrical, crowded, erect spike, the lower part of which is composed of bulbils. Perianth white or light flesh-coloured.

Rocky Alpine and subalpine pastures (frequently up to 9000 feet), descending to the valleys. June to August.

Distribution.—Alps, Carpathians, Pyrenees, Jura, Europe, Asia, North America, Arctic regions. (British.)

Polygonum Bistorta L. (Bistort)

Stem 1–3 feet high. Leaves lanceolate-ovate, with cordate base and winged leaf-stalk; upper leaves sessile. Flowers in a short terminal spike, pink.

Damp meadows and pastures in the Alps and plains, frequently giving a pinkish tinge to the colour of the Alpine meadows before the grass is cut, as so cleverly shown in some of Mr. Flemwell's pictures.

Distribution.—Europe, Asia, North America, and Arctic regions. (British.)

Polygonum alpinum All.

Stem 1–2 feet high, branched, leafy. Leaves lanceolate, acute, narrowed into a short petiole, wavy or toothed. Flowers in a paniculate raceme, yellowish white or pink. Scaly sheaths (ochreæ) with rough hairs. Fruit shining, trigonous, equalling the perianth.

Damp meadows and screes; local. July, August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Central and Northern Asia.

Polygonum aviculare L. (Knot Grass)

The common Knot Grass is often seen in a dwarf state in the Alps. The var. *nana* Boiss. (*P. nanum* Bory.) we have from 9000 feet (2745 metres) at Mont Cenis and from the Engadine.

THYMELÆACEÆ

Herbs or shrubs, with white, pink, or green flowers, which are usually bisexual. Perianth with 4 equal lobes, often petaloid and fragrant. Ovary usually 1-celled. Fruit a drupe or berry.

About 400 species, inhabiting temperate and hot regions.

DAPHNE L.

Shrubs with white, pink, or green fragrant flowers, and often thick evergreen leaves. Perianth tubular, 4-lobed, petaloid. About 80 species, inhabiting Europe, Asia, and Africa.

Daphne alpina L. (Plate LX.)

A small shrub. Leaves lanceolate or obovate, spathulate, downy, ultimately glabrous, deciduous. Flowers terminal, crowded, sessile, woolly, appearing at same time as leaves, fragrant. Perianth white, segments lanceolate, acuminate, about one-third shorter than the perianth-tube.

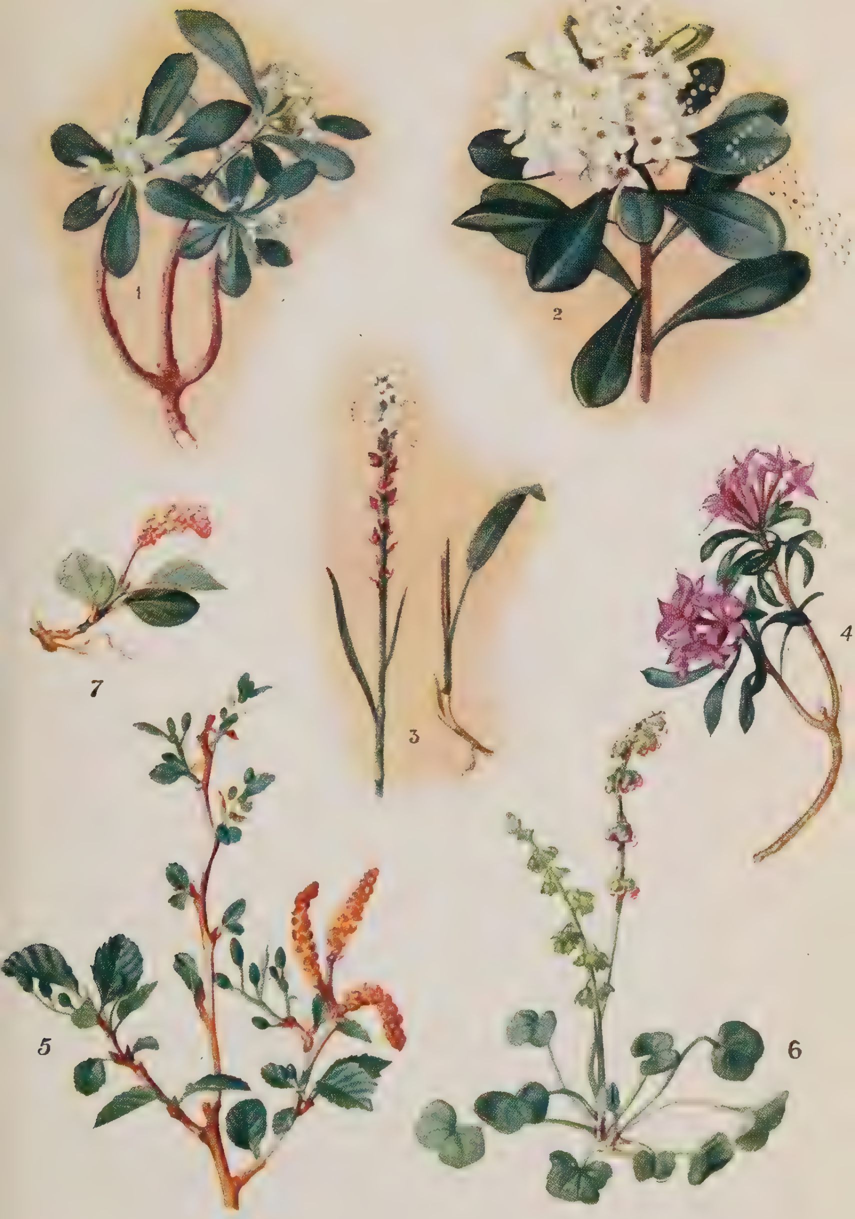

PLATE LX.

1. Daphne alpina L.
2. Daphne Blagayana Freyer.
3. Polygonum viviparum L.
4. Daphne striata Tratt.
5. Alnus vividis D.C.
6. Oxyria digyna Hill.
7. Salix reticulata L.

Alpine and subalpine rocks, descending to the plains; local. May, July.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Cevennes, Pyrenees; mountains of the Var.

Plant in a mixture of loam and sand, in a half-shady position on the rockery.

Daphne striata Tratt. (Plate LX.)

A dwarf shrub 6–20 inches high. Stems very leafy at the summit. Leaves linear-wedge-shaped, 1-nerved, retuse or emarginate, shortly mucronate, glabrous. Flowers carmine or purple-red, in terminal clusters, sessile, glabrous. Perianth-lobes elliptical, about two-thirds length of perianth-tube. Bracts ovate, shortly mucronate, one-third length of perianth-tube.

Rocky limestone pastures, also on crystalline rocks, up to 8000 feet (Galibier); local. June, July.

Distribution.—Tyrol, Styria, Salzburg, Switzerland, and Hautes-Alpes; Carpathians.

Plant very firmly in a mixture of peat, sand, and limestone, broken up small, and give a top-dressing in the autumn. It should not be planted under trees, or where any water drips.

Daphne Blagayana Freyer. (Plate LX.)

An evergreen, creeping shrub with coriaceous leaves and very fragrant, yellowish white flowers. Stem ascending, usually simple. Leaves obovate-lanceolate, obtuse, glabrous. Flowers in terminal clusters. Tube of perianth slightly hairy on the outside, longer than the oval segments of the perianth-limb. April, May.

Distribution.—Carinthia, Styria, and Carniola; very rare.

This species prefers a rather shady place on the rockery or on the side of the bog garden, well above the water line. It likes peat and loam, or peat, leaf-mould, and sand, and should be top-dressed once a year, preferably in August, after the young shoots have been pegged down, to encourage them to layer; or stones might be placed on the prostrate branches with the same object. It is not difficult to grow.

Daphne Cneorum L.

This is found in hot, dry pastures in Southern Switzerland (Tessin) and the Jura, and in the Eastern Alps up to 5600 feet, but it cannot be considered an Alpine plant any more than *D. Laureola* L. is, which is found in mountain woods. The well-known *D. Mezereum* L., again, is frequently seen high up in the Alps at 7000 and even 8000 feet, but never in large quantity. *D. rupestris* is a small rare species from Southern Austria.

EMPETRACEÆ

Empetrum nigrum L.

This well-known prostrate shrub, with wiry branches and linear leaves, pale red flowers and black berries, is locally common in the Alps, and is an example of a plant which is sometimes found at sea level in England (as in Dorset), in the Arctic regions, and at over 8000 feet in the Alps of Europe.

Distribution.—Europe, Asia, North America, Arctic regions.

SANTALACEÆ

THESIUM L.

Flowers minute, hermaphrodite, solitary and axillary or in cymes. Calyx 3–5 lobed, persistent. Stamens 3–5, attached to the calyx. Ovary 1-celled. Fruit a 1-celled, 1-seeded achene. Leaves narrow, entire, without stipules. Slender herbs parasitic on roots, of which there are about 100 in the ancient world and in Brazil.

Thesium alpinum L.

Stem prostrate, branching on one side only, leafy from the base upwards. Calyx rolled up at the tip after flowering, as long as or longer than the fruit. Middle bract much longer than the two lateral ones.

Dry pastures and stony places in the Alps and sub-Alps up to 7500 feet.

Distribution.—Eastern, Central, and Western Alps; Western and Northern Asia.

There are 3 or 4 more species of Thesium found in the Alps, including the British *T. montanum* Ehrh. They are all difficult to determine.

EUPHORBIACEÆ

The Spurge Order is one of the largest, and the family contains over 3000 species, represented in nearly every part of the globe except in the Arctic regions.

Euphorbia Cyparissias L.

This limestone-loving plant is, of course, not an 'Alpine,' in so far as it is common in the plains, but it is so often met with at high elevations (up to 2745 metres or 9000 feet on the Aig. du Goléon) that a brief description may be useful. About 8 inches high usually in the Alps; glabrous and yellow in colour, turning red in autumn. Stem reddish at the base, branched, erect, with numerous leafy shoots and a terminal umbel of yellow flowers. Leaves numerous, linear, entire, those of the branches setaceous and almost imbricate, those of umbel linear, spreading. Umbel of numerous slender branches. Bracts not mucronate, broadly ovate - triangular. Fruit glabrous, trigonous.

Gravelly and stony places in the Alps, sub-Alps, and plains; often on moraines, especially on limestone. May to September.

Distribution.—Almost all Europe.

BETULACEÆ (or AMENTACEÆ)

Trees or shrubs with alternate stipulate leaves. Flowers monœcious. Male flowers in drooping catkins. Sepals 4 or less. Stamens 2–4. Female flowers 2–3, under each scale of a catkin. Perianth 0. Fruit indehiscent. A small family, chiefly found in the temperate regions.

Betula nana L. (Dwarf Birch.)

A small dwarf shrub. Leaves very shortly stalked, nearly orbicular, about ½ inch long, very obtuse, serrated or crenate. Catkins small and sessile, the males oblong, the females very short (3 lines), erect.

Moors and bogs in the Alps and sub-Alps up to 6500 feet; local. May, June.

Distribution.—Central and Northern Europe, Asia and Arctic America. (British.)

Betula pubescens Ehrh.

With larger, pointed leaves, grows in similar places, and its geographical area is much the same.

Alnus viridis DC. (Green Alder). (Plate LX.)

A shrub, attaining the size of a small tree in the lower mountains sometimes. Leaves stalked, green on both sides, ovate, acute, doubly serrate, glabrous or with short hairs on the nerves, especially when young. Flowers in monœcious catkins; male catkins cylindrical, solitary, or 2–5, in pendent racemes, 1–2 inches long, deciduous. Female catkins oval, stalked, 2–5, in erect racemes, catkins scarcely ½ inch long, forming a woody cone which ripens the second year.

On mountains and in clearings in the lower Alps, and scattered over the Alps, especially the granitic; sometimes covering great areas; 3000–6600 feet. April to June.

Distribution.—Central and Eastern Europe; Arctic Asia and America.

SALICACEÆ

Trees or shrubs with alternate, stipulate leaves. Flowers diœcious. Perianth 0. Male flowers (in catkins) of 2 or more stamens. Female flowers of a 1-celled ovary with 2 styles and many ovules. The family is not represented in Australia or Malay.

SALIX L.

Trees or shrubs, with simple, entire, or serrate leaves. Stipules persistent or deciduous. Stamens 2 or more. Catkins usually erect. Many species found in damp and cold regions of the globe, with a great tendency to hybridise.

Salix retusa L.

A small, creeping shrub with ascending branches and 5–9 flowered terminal catkins. Leaves obovate, running into a short leaf-stalk, entire or glandular-serrate at the base, obtuse, sometimes emarginate, glabrous, shining above, smooth beneath. Female catkins, long, few-flowered. Scales as long as the glabrous ovary. Stigmas 2–3 cleft. Lobes filiform.

Wet Alpine pastures and rocks up to 10,000 feet. June, July.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Pyrenees, Jura, Apennines, Balkans, Altai.

The variety *serpyllifolia* Scop. has much smaller leaves.

Salix arbuscula L.

An erect shrub, 2–3 feet high, bushy, with small coriaceous leaves, which have 5–8 yellow glandular teeth. Leaves lanceolate-elliptical or obovate, entire or serrate, glabrous or slightly hairy when young, dark green and shining above, light green and glaucous beneath. Catkins at apex of short leafy shoots; scale of catkins 2-coloured, brown or blackish at apex. Stamens 2. Anthers yellow. Nectary projecting above the mass of the ovary. Style elongated. Stigmas divaricate.

Alpine rocks and pastures. June to August.

Distribution.—Carpathians, Alps, Pyrenees, Caucasus, Siberia, Greenland. (British.)

Salix reticulata L. (Plate LX.)

A small, creeping shrub, with round, entire, net-veined leaves, bluish green on the under side. Leaves oval or nearly orbicular, obtuse, often nearly truncate or shortly apiculate, with recurved margin, glabrous or silky when young, dark green and shining on the upper side, glaucous below. Catkins terminal, on leafy stalks. Stamens 2, distinct. Anthers purplish red. Ovary ovoid, woolly, sessile. Nectary projecting above base of ovary. Style short. Stigmas divaricate.

Moist, stony Alpine places up to 8600 feet. June to August.

Distribution.—Carpathians, Alps, Pyrenees; Arctic Europe, Asia, and America. (British.) Often found fossilised.

Salix herbacea L.

A very small, creeping shrub, the branches only about 2 inches above the ground. Leaves obovate or orbicular, finely crenated, green, glabrous, and veined like those of *S. Myrsinites* (which has elliptical leaves), slightly silky when young. Catkins very small, ovoid, few-flowered, on short, leafless peduncles or almost sessile. Capsules nearly glabrous.

High Alpine pastures in damp and stony places up to 11,000 feet. June to August.

Distribution.—Carpathians, Alps, Pyrenees; Arctic Europe, Asia, and America. (British.)

Salix Myrsinites L., *S. repens* L., *S. lapponum* L., *S. helvetica* Vill., *S. glauca* L., *S. cæsia* Vill., *S. hastata* L., *S. phylicifolia* L., *S. grandiflora* Ser., and others are sometimes seen in the Alpine region.

CLASS II. MONOCOTYLEDONS

ORCHIDACEÆ

Perennial herbs with roots often thickened into tubers, entire and parallel-nerved leaves and irregular flowers, solitary or in spikes, racemes, or panicles, each one in the axil of a bract. Perianth superior, irregular, with 6 petal-like segments, the 3 outer ones nearly alike, the lower of the 3 inner ones (the lip) usually larger and often spurred. Stamens 1–2. Pollen usually collected into a pollinium. Ovules minute, very numerous. Fruit a 3-valved capsule.

A very large family of more than 5000 species, spread all over the globe. The tropical ones are mostly epiphytes.

ORCHIS L.

Root of globose, ovoid, or palmate tubers. Leaves chiefly radical, sheathing. Flowers in spikes. Sepals and petals ascending, connivent, or the lateral sepals spreading. Lip spurred.

About 120 species, inhabiting Europe, temperate Asia, Africa, and America.

Orchis globosa L. (Plate LXI.)

Tubers elliptical, undivided. Stem leafy, 8–18 inches high, slender. Leaves linear or linear-lanceolate, bright green, not spotted. Flowers rather small, lilac or pink; labellum spotted with purple. Spike short, conical or nearly globular, compact. Bracts as long as or longer than ovary, 1-nerved, or the lower ones 3-nerved. Labellum 3-cleft. Segments linear, middle one somewhat larger, obtuse or truncate, emarginate. Spur short, directed downwards, one-third to half the length of ovary, remaining 5 perianth segments terminating in a wedge-shaped point and approximating into a bell-shaped helmet.

Alpine and subalpine pastures; 4000–7800 feet; local. May to July.

Distribution.—Carpathians, Erzgebirge, Eastern, Central, and Western Alps; Black Forest, Vosges, Jura; Pyrenees, Apennines, Balkans, Caucasus.

Like many of the European Orchids, it prefers a limestone soil.

Orchis sambucina L. (Plate LXI.)

Tubers long and undivided, or shorter and 2–3 lobed. Stem leafy, 4–10 inches high. Leaves not spotted, dark green, lower

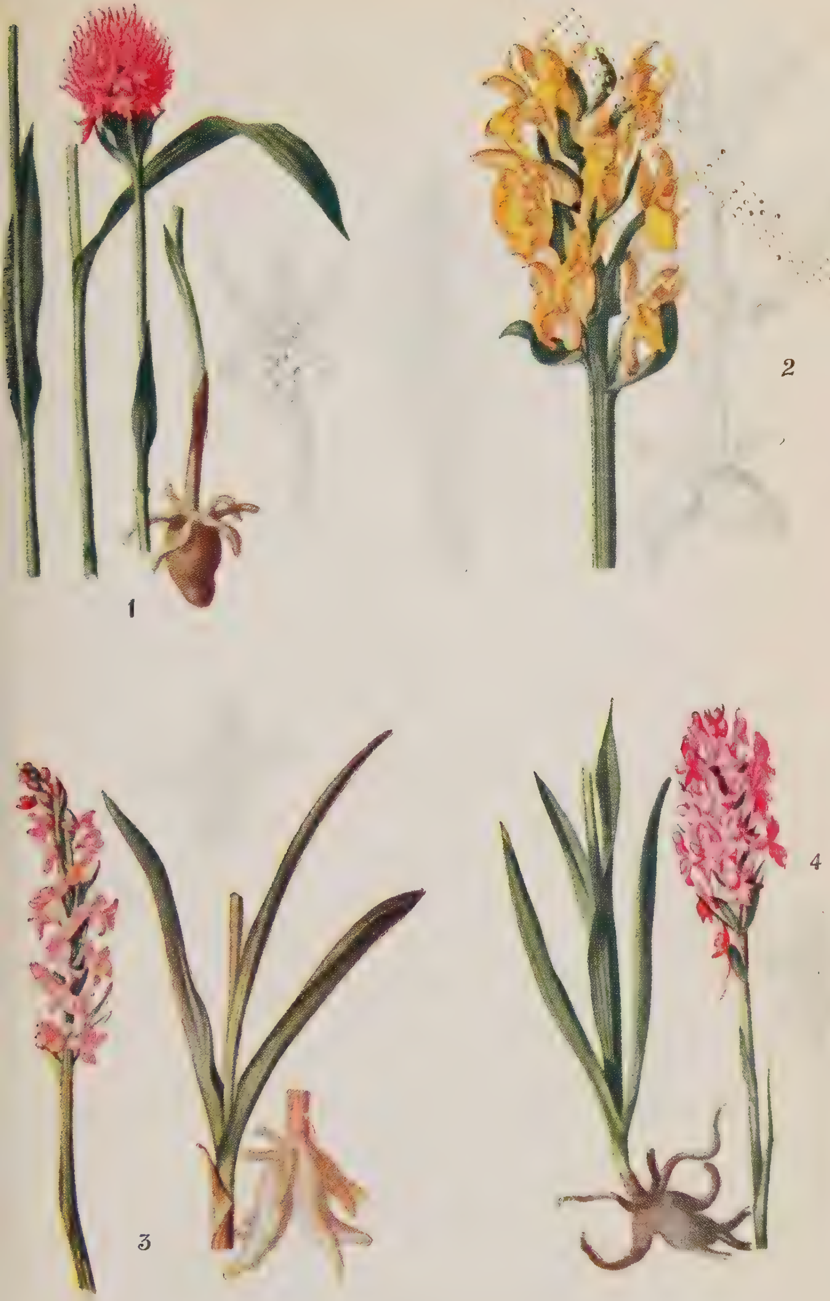

PLATE LXI.

1. Orchis globosa L.
2. Orchis sambucina L.
3. Gymnadenia odoratissima Rich.
4. Gymnadenia conopsea R.Br.

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ones wedge-shaped, broader towards apex, the next lanceolate. Spikes long, moderately dense. Flowers pale yellow or more rarely purple (var. *purpurea* Koch). Bracts many-nerved, about as long as the perianth. Perianth-segments rather obtuse, the two lateral ones spreading, recurved, the 3 upper ones connivent into a helmet. Labellum shallowly 3-lobed or nearly entire, lateral lobes rounded, middle lobe smaller, obtuse or emarginate. Spur cylindrical, directed downwards, as long as or longer than the ovary.

High mountain pastures, often in large quantities. May to July.

Distribution.—Carpathians ; Eastern, Central, and Western Alps ; Harz Mountains ; most of the mountain ranges of Europe.

GYMNADENIA R. Br.

Tubers 2 or more lobed. Sepals spreading. Lip long, spurred, recurved or deflexed. Anther-cells parallel. Pollen-glands remote, linear.

Gymnadenia albida Rich. (Plate LXII.)

Tubers deeply divided palmately. Lobes cylindrical or tapering. Stem leafy, 4–10 inches high. Lower leaves obovate-lanceolate ; upper leaves lanceolate, often small, sheathing. Spike cylindrical, dense, slender, and often slightly unilateral. Bracts 3-nerved, about as long as ovary. Perianth very small, yellowish white, slightly fragrant. Segments obtuse, all 5 connivent into an ovate helmet. Labellum 3-lobed, lobes tongue-shaped, acute, the middle one broadest. Spur cylindrico-conical, directed upwards, half or one-third length of ovary.

Meadows, pastures, margins of woods, and among debris in the Alps and lower Alps from 3000–7000 feet, both on limestone and slate. June to August.

Distribution.—Carpathians ; Eastern, Central, and Western Alps ; Black Forest, Vosges, Pyrenees, Cevennes ; Central and Northern Europe, Greenland. (British.)

Gymnadenia conopsea L. (Plate LXI.)

Tubers palmately divided. Stem leafy, 12–18 inches high. Leaves lanceolate or linear-lanceolate, upper ones often very small, sheathing. Spike cylindrical, dense-flowered. Bracts 3-nerved, about as long as ovary. Labellum 3-partite. Lobes nearly alike, obtuse, or the middle one acute. Spur filiform, bent downwards, 1½ to twice the length of ovary. Remaining perianth-segments obtuse, the 3 upper ones approximate, forming a helmet, the 2 lateral spreading or reflexed. Very variable both in colour of flowers and size of the separate parts. Usually rose-coloured, lighter or darker, or various shades of purple or mauve, rarely white, with slight scent of vanilla.

Alpine and subalpine pastures, often in great quantities, and also in the plains. June, July.

Distribution.—Almost all Europe, Western and Northern Asia. (British.)

Gymnadenia odoratissima Rich. (Plate LXI.)

Very similar to certain forms of the last, but the leaves are narrower, and the spike frequently more slender. The lip is narrower, and the spur is filiform and very much shorter. The flowers are strongly scented of vanilla, and rather smaller.

Alpine and subalpine meadows and pastures ; less common than the last. June, July.

The two species often grow together and occasionally hybridise, every intermediate form being found.

Distribution.—Carpathians ; Eastern, Central, and Western Alps ; Central Europe.

Chamæorchis alpina Rich. (Plate LXII.)

Tubers ovoid. Root-leaves linear. Stem naked, 2–5 inches high. Spike short, many-flowered. Bracts longer than the ovary. Labellum ovate, with a tooth on each side. Flowers yellowish green, tinged with red.

Alpine pastures, chiefly on the calcareous Alps ; 6000–8500 feet. July, August. No European Orchid reaches a greater elevation than this, and it has been found by the writer at Mont Cenis and above Zermatt at about 8500 feet. Rather rare.

Distribution.—Carpathians ; Eastern, Central, and Western Alps ; Central and Northern Europe, Norway, Sweden, Lapland.

Nigritella angustifolia L. (Vanilla Orchid). (Plate LXII.)

Tubers palmately divided. Stem 3–8 inches high, leafy below and sometimes throughout. Leaves linear, channelled, the lower ones crowded. Spike conical or ovate, densely flowered. Bracts as long as or longer than the perianth. Flowers small, like the bracts, dark carmine (*N. rubra* Richter, Plate LXII) or purple-black (*N. nigra* Reichb.), with the odour of vanilla. Labellum ovate, apex acuminate, entire or slightly crenate. Spur very short, obovate, much shorter than ovary. Remaining perianth segments lanceolate, acuminate.

Alpine and subalpine pastures, often in batches ; 5000–8500 feet. June to August.

Distribution.—Carpathians ; Eastern, Central, and Western Alps ; Cevennes, Pyrenees, Apennines, Balkans, Scandinavia, mountainous Europe.

The red variety (*N. rubra* Richter), which is the one illustrated, is found in the Grisons and in the Maritime Alps.

Cypripedium Calceolus L. (Lady's Slipper). (Plate LXII.)

Rootstock cylindrical, knotty, horizontal, tufted, with fleshy fibres. Stem downy and leafy, 1–2 flowered, about a foot high. Leaves elliptical or ovate-lanceolate, strongly nerved, glabrous

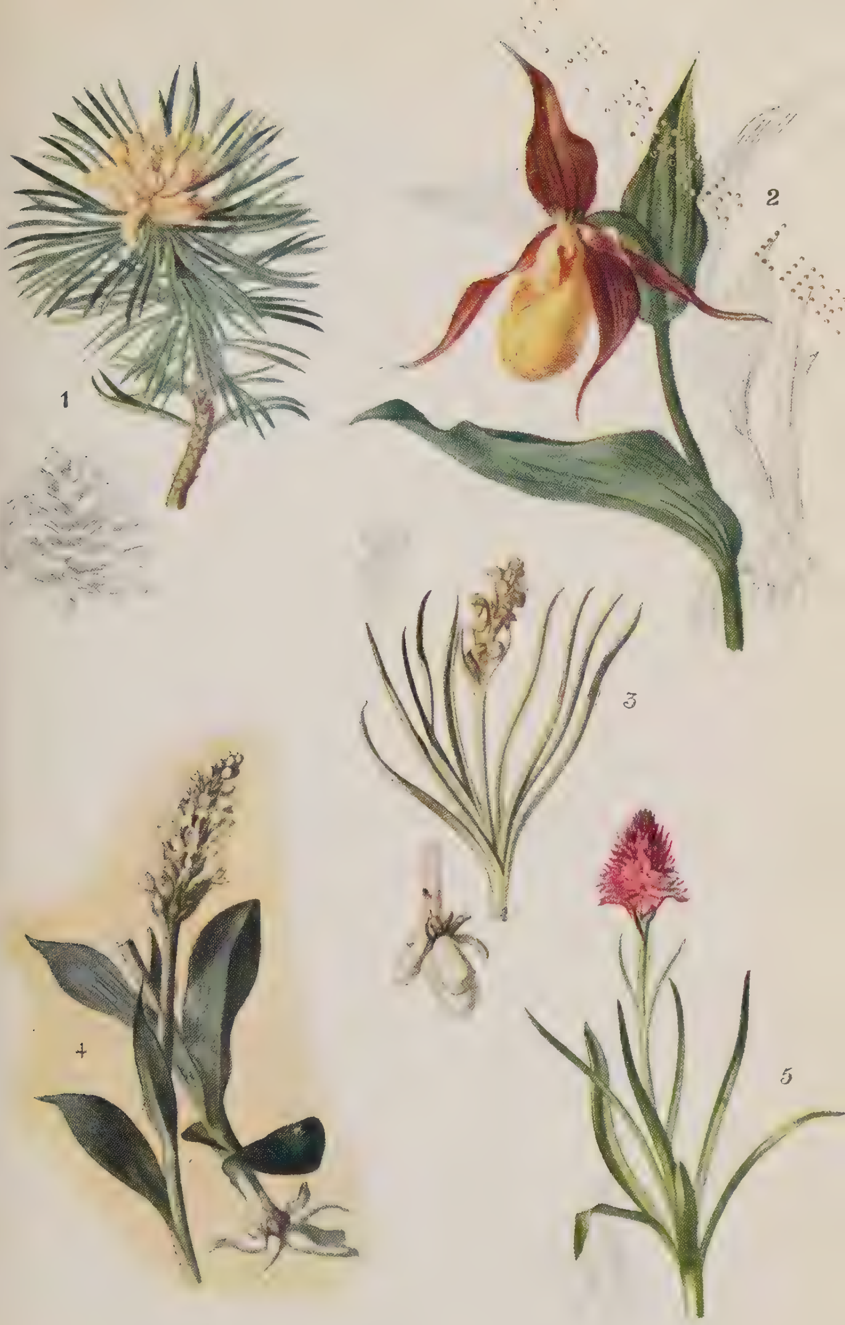

PLATE LXII.

1. Pinus montana Miller.
2. Cypripedium Calceolus L.
3. Chamæorchis alpina Rich.
4. Gymnadenia albida Rich.
5. Nigritella rubra Richter.

above, downy beneath and at margin. Bracts similar to stem-leaves, but smaller. Labellum yellow, saccate, large, not spurred; the other perianth-segments spreading, 1½ inch long, purple-brown, the upper one broadly lanceolate, acuminate; a similar one (formed of the 2 lateral segments combined into 1) under the lip; the 2 inner lateral ones linear-lanceolate, acute, usually twisted.

Alpine and subalpine woods, chiefly on steep, mossy limestone slopes under the Pines or near rocks. June. (Not strictly Alpine.)

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura; Pyrenees, Caucasus, Siberia. In Europe almost to the Arctic Circle. (British.)

The following Orchids are more or less frequently seen in Alpine woods or pastures in Central Europe, more particularly on the limestone: *Corallorrhiza innata* R. Br., *Listera ovata* R. Br., *L. cordata* R. Br., *Orchis ustulata* L., *O. speciosa* Host., *O. maculata* L., *O. incarnata* L., *O. latifolia* L., *Herminium monorchis* R. Br., *Cœloglossum viride* Hartm., *Cephalanthera rubra* Rich., besides many others in the subalpine zone.

Orchids are generally considered difficult to cultivate, and many have a reputation for not flowering when transplanted. But if they are never moved when in flower or making growth, but in the early autumn, they are much more likely to succeed. A moist loam and peat suits most, but others require lime mixed with the loam instead of peat. All require a deep soil. It is much to be hoped, however, that collectors will leave alone not only many of the British species, but all the rarer ones which grow in the Alps.

IRIDACEÆ

Perennial herbs, with bulbous, tuberous, or shortly creeping rootstock, frequently ensiform leaves, and regular flowers with 2 bracts. Perianth 6-lobed. Stamens 3. Style simple. Stigmas often dilated. Fruit a 3-celled capsule.

About 100 species. Europe, temperate Asia, Africa, and America.

Crocus albiflorus Kit. (Plate LXIII.)

This includes *C. vernus* All., which some botanists have considered a separate species.

Corm covered with dry, membranous scales. Scape enveloped in a sheath. Leaves grass-like, recurved at margin. Stigmas orange, shorter than the perianth-segments. Perianth 6-lobed. Flowers opening before or with the leaves immediately the snow begins to disappear, white or violet, the white form having a yellowish tube.

Alpine and subalpine pastures up to 7600 feet, often in great profusion. April to June, according to situation.

Distribution.—Eastern, Central, and Western Alps, Jura, Cevennes, Pyrenees, Carpathians, Balkans; often naturalised in the plains and in England.

AMARYLLIDACEÆ

About 700 species in the temperate and hot regions of the Old and New World.

Narcissus poeticus L. (Plate LXIII.)

This well-known plant is not strictly Alpine, for it is most abundant in subalpine meadows and valleys, but sometimes it reaches 6600 feet, as at Mont Cenis and Saas Fee in Switzerland, where also the common Daffodil can be found in flower in June.

LILIACEÆ

Perennial herbs with creeping, bulbous or clustered rootstock, and either radical leaves and peduncles, or annual or biennial, leafy flowering stems. Flowers usually hermaphrodite. Perianth usually 6-lobed. Stamens 6, hypogynous or attached to the perianth-lobes. Styles 1 or 3, rarely 0. Fruit usually a 3-celled capsule or berry.

A large family of nearly 2000 species, widely spread over many regions of the globe.

Streptopus amplexifolius DC.

Rootstock oblique, knotted with abundant fibres. Stem erect, simple or branched, zigzag, glabrous like the whole plant. Leaves cordate-lanceolate, entire, acuminate, amplexicaul, sea-green on under side. Flower-stalks usually solitary, 1-flowered, bent downwards nearly at a right angle. Flowers whitish. Berries globular or ellipsoidal, watery, scarlet.

Alpine and subalpine woods up to 6500 feet; local. June, July.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Vosges, Cevennes, Pyrenees, Corsica; Central Europe, Asia, North America.

Polygonatum verticillatum All. (Plate LXIII.)

Rootstock creeping, knotted, horizontal. Stem angular, 1–3 feet high, bearing whorls of 3–7 leaves, which are lanceolate or linear-lanceolate, acuminate, entire, sessile, glabrous. Flowers axillary, pendent, in whorls of about 6, 1–3 on each flower-stalk, greenish white, tubular. Berries globular, violet, blue-black later.

Margins of woods, clearings, and shady, rocky places in the Alps and sub-Alps up to 6500 feet. May, June.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Vosges, Jura, Ardennes, Cevennes, Pyrenees, Central and Northern Europe, Central and Western Asia. (Rare in Britain.)

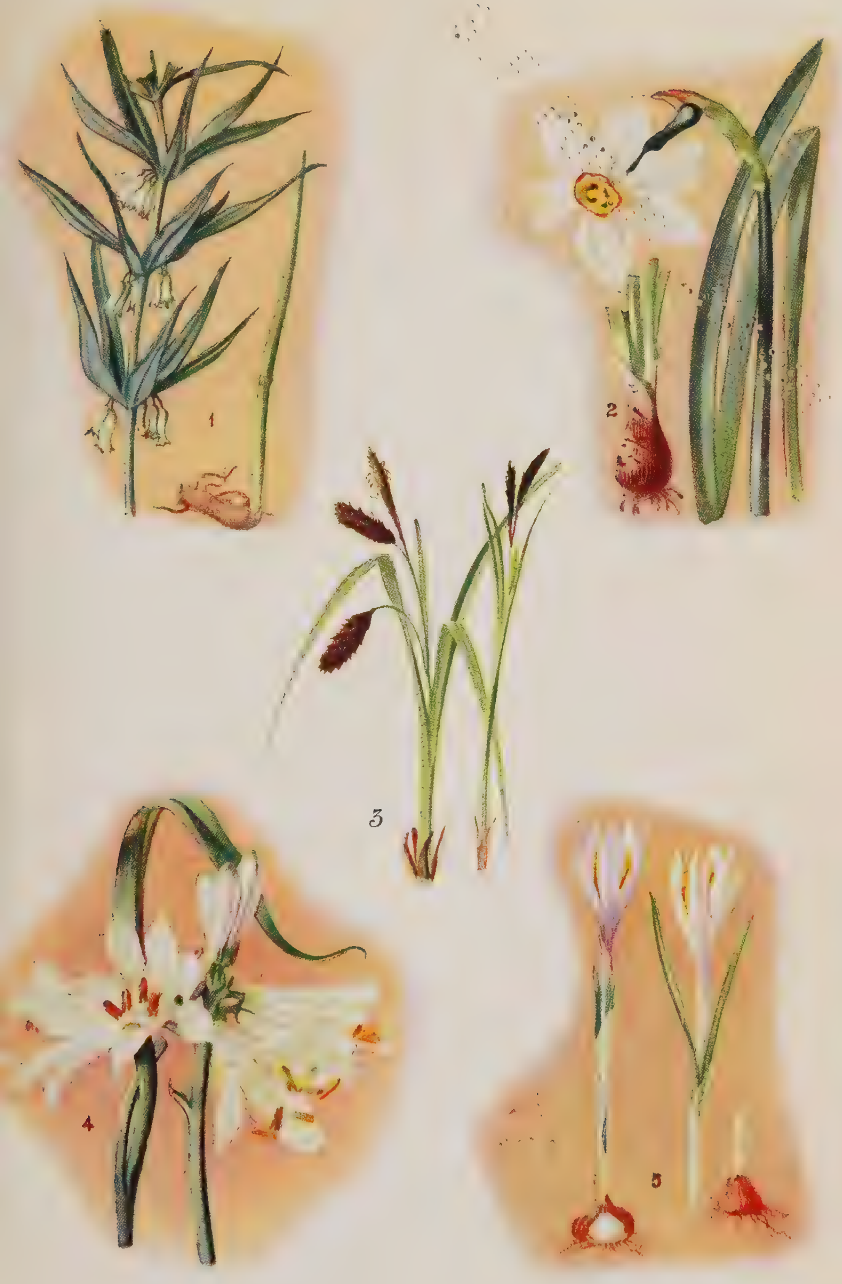

PLATE LXIII.

1. Polygonatum verticillatum All.
2. Narcissus poeticus L.
3. Carex atrata L.
4. Paradisia Liliastrum Bert.
5. Crocus albiflorus Kit.

LILIUM L.

Bulbs scaly. Stem leafy. Flowers large. Stamens hypogynous or attached to the base of the perianth-lobes. Anthers versatile. Fruit a 3-celled capsule.

About 50 species, inhabiting temperate regions of the northern hemisphere, and particularly Japan.

Lilium Martagon L. (Turk's-cap Lily.)

2–3 feet high. Leaves in whorls of 6 or 8. Flowers dull pink or lilac, spotted with dark purple, pendent, with recurved segments.

Alpine meadows and pastures and bushy places up to 7300 feet, especially on limestone; local, but sometimes quite numerous. June to August.

Distribution.—Central and Southern Europe, Caucasus, Siberia, Japan.

Lilium Pomponium L.

This brilliant red, handsome Lily, with leafy stem and narrow linear leaves, is found in stony places in the Ligurian Alps as high as 6000 feet, but is never abundant. May to July.

Distribution.—Var, Basses-Alpes, Alpes-Maritimes, Piedmont.

Lilium Croceum Chaix.

This well-known deep orange Lily is chiefly a native of the warmer subalpine districts in the south, but in Switzerland it sometimes reaches 5300 feet. It is the variety of *L. bulbiferum* L., without bulbils. Both occur in Switzerland. June, July.

Distribution.—Jura, Switzerland, Western Alps, Corsica, Eastern France.

FRITILLARIA L.

Bulbous herbs with a more or less leafy stem, and 1 or more rather large drooping flowers in a terminal raceme. Perianth bell-shaped, with distinct segments, as in Tulip; but the three inner segments have a nectariferous cavity at their base. Stamens inserted at the base of the perianth, the anthers being attached a little above their base. Capsule 3-celled, with several rather flat horizontal seeds in each cell, as in Tulip.

About 50 species inhabit the temperate regions of the northern hemisphere, being found in Europe, Asia, and North America. They might be more cultivated, for many are both handsome and early flowering.

Fritillaria delphinensis Gren.

Stem 8–12 inches high, leafy above, naked below. Leaves 4–8, broadly lanceolate, flat, erect, alternate. Flower large, purple, obscurely spotted, 1½ inch long. Perianth segments connivent, concave, the interior segments being oval-elliptic and rounded. Capsule obovate.

High pastures in the Alps; local. May to July.

Distribution.—Savoy, Dauphiny, Provence, Corsica, Northern Italy, Tyrol.

There are two very rare and beautiful varieties which grow together on a steep mountain side in the Italian Maritime Alps at about 7000 feet. *F. Moggridgei* Boiss. et Reut., with very handsome, large lemon-yellow flowers, and *F. Burnati* Planchon, with somewhat smaller flowers of a rich purple-brown, hanging on a slender stem. It is peculiar to that district, and named in honour of the veteran Swiss botanist Mons. Emile Burnat, whose great work *La Flore des Alpes Maritimes* is approaching completion.

TULIPA L.

Tulipa australis Link.

This slender and beautiful Tulip, with yellow perianth tipped with red, is found in the Valais and in pastures in many parts of Western Europe and Tyrol. The Alpine variety, *T. alpestris* Jordan, grows at a height of between 6000 and 7000 feet in the Italian Maritime Alps, and is a beautiful object, especially when it grows with *Fritillaria Burnati* and the yellow *Fritillaria Moggridgei* at the same high elevation.

LLOYDIA Salisb.

Lloydia serotina (L.) Reichb. (Plate LXIV.)

A small bulbous plant with filiform root-leaves and leafy stem, 2–4 inches high, the stem-leaves being shorter and broader. Perianth 6-lobed, each segment with a nectariferous cavity at the base. Flowers solitary, white, veined with red. Perianth-lobes obtuse. Seeds flat.

High Alpine pastures and rocky ledges up to 8800 feet, and sometimes higher; rather rare. July, August.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Urals, Altai, Himalaya, Arctic regions, North America. (British.)

PARADISIA Mazzuc.

Paradisia Liliastrum Bertol. (Plate LXIII.)

Stem leafless, simple, 1–2 feet high, 3–5 flowered. Leaves linear, slightly furrowed, radical. Flowers in a loose and somewhat unilateral raceme, pure white, and resembling those of a Lily, but somewhat smaller. Perianth 6-lobed, funnel-shaped. Ovary above the receptacle on a short gynophore. Stamens inserted beneath the ovary at the top of the gynophore.

Alpine meadows and pastures up to 6600 feet.

Distribution.—Eastern, Central, and Western Alps; Jura, Pyrenees, Spain and Portugal, Italy.

Anthericum Liliago L., though popularly believed to be an 'Alpine,' because it frequently accompanies the last handsome plant in the mountains, is more strictly a hill plant, and is found in dry, sunny pastures and hills in the greater part of France.

GAGEA Salisb.

Gagea Liottardi Schult. (Plate LXIV.)

Bulbs 1 or 2 in each sheath. Leaves 1–3, usually 2, the one from the larger bulb stouter, glabrous, trigonous, slightly furrowed, tubular towards the apex. Bracts 2, large, opposite, bulging in the middle, and 2 or 3 linear bracts in the branches of the umbel. Flower-stalks woolly. Flowers variable; the first have often only 4 perianth-segments and stamens, the latter ones only 5 segments, yellow within and at the margin, green without.

Rich soil in high Alpine pastures (often near chalets) up to 7500 feet; local. June, July.

Distribution.—Eastern, Central, and Western Alps.

ALLIUM L. (Onion)

Flowers in rounded umbels, surrounded by a membranous spathe. Perianth-segments distinct. Fœtid herbs with radical leaves and a usually naked scape.

A. Victorialis L. (Plate LXIV.)

Rootstock as thick as the finger, sheathed, 2–3 inches long. Stem 1–1½ foot high, leafy nearly to the middle, naked and angular above. Leaves elliptical or lanceolate, narrowed into a short leaf-stalk, with a long sheath, persistent. Leaves 3–8 inches long, 1–3 inches broad, grass-green. Perianth whitish green, funnel-shaped. Stamens longer than perianth. Umbel globular, fertile, large.

Pastures and rocky, bushy places in the calcareous Alps; local. June to August.

Distribution.—Carpathians, Riesengebirge; Eastern, Central, and Western Alps; Jura, Vosges, Black Forest, Cevennes, Pyrenees, Caucasus, Northern Asia, North America.

Allium Schœnoprasm L. var. *sibiricum* (L.) = *A. roseum* Krock non. Linn.

Flowers a beautiful bright rose-colour, in small spherical umbels, on stems 6–8 inches high. Leaves linear.

Damp Alpine meadows and pastures up to 8000 feet. July.

Distribution.—Western Alps, as at Mont Cenis, where it is abundant, and the Col du Galibier on the confines of Dauphiny.

VERATRUM L.

Rootstock creeping. Stems tall, robust, leafy. Leaves oval, with very strong nerves. Flowers in branched panicles, sometimes imperfect. Anthers hypogynous. Fruit a many-seeded capsule formed of three carpels united.

A small family of about 10 species inhabiting Europe, Asia, and North America. They are all acrid and poisonous.

Veratrum album L. (Plate LXIV.)

Stem simple, 2–3 feet high, erect, cylindrical, covered below with pubescent leaf-sheaths, thickened to a bulb at the base, scaly or somewhat floccose like the flower-stalks, with large sessile leaves, regularly creased at the base, and bearing a paniculate inflorescence. Leaves entire, creased, veined, seated on long sheaths, glabrous above, downy beneath, the lower ones oval, obtuse, the uppermost lanceolate, acute. Flowers numerous, greenish white, in large panicles. Perianth-segments longer than the flower-stalks.

Abundant in grassy Alpine and subalpine pastures up to 8200 feet. July to September.

Distribution.—Carpathians, Riesengebirge; Eastern, Central, and Western Alps; Jura, Vosges, Cevennes, Pyrenees, Caucasus, Siberia, Japan.

The leaves resemble those of *Gentiana lutea*, and both plants are avoided by the cattle and by the mowers for fear it should get into the hay.

Veratrum nigrum L.

Flowers purplish black, smaller than the last, and on longish erect pedicels. Oval, lanceolate leaves, lengthened below into a short petiole. Perianth-segments as long as the pedicels.

High mountain limestone pastures; rare. July, August.

Distribution.—Eastern Alps, Tessin (Monte Generoso), Maritime Alps, Eastern Europe, Western and Northern Asia.

The irritant poison known as Veratrin is obtained from Veratrum.

COLCHICUM L. (Autumn Crocus)

Colchicum alpinum Lam. et DC.

Resembles the common *C. autumnale*, which grows commonly in the Alps and sub-Alps, but smaller in all its parts, and the capsule is surrounded by 2 leaves, whereas there are usually 3 or 4 in *autumnale*.

Damp Alpine pastures and meadows; very local, up to 6500 feet. August.

Distribution.—Switzerland and Western Alps, Var, Corsica, Italy, Sicily.

The flowers appear very suddenly, and the leaves develop the following year.

TOFIELDIA Hudson

Small plants with creeping rootstocks. Leaves grass-like, chiefly radical, flattened vertically, and sheathing like the leaves of an *Iris*. Flowers small, yellow, in terminal spikes. Perianth of 6 segments, persistent round the capsule, which is small and 3-lobed. Stamens attached to the perianth-segments.

This small genus is chiefly North American.

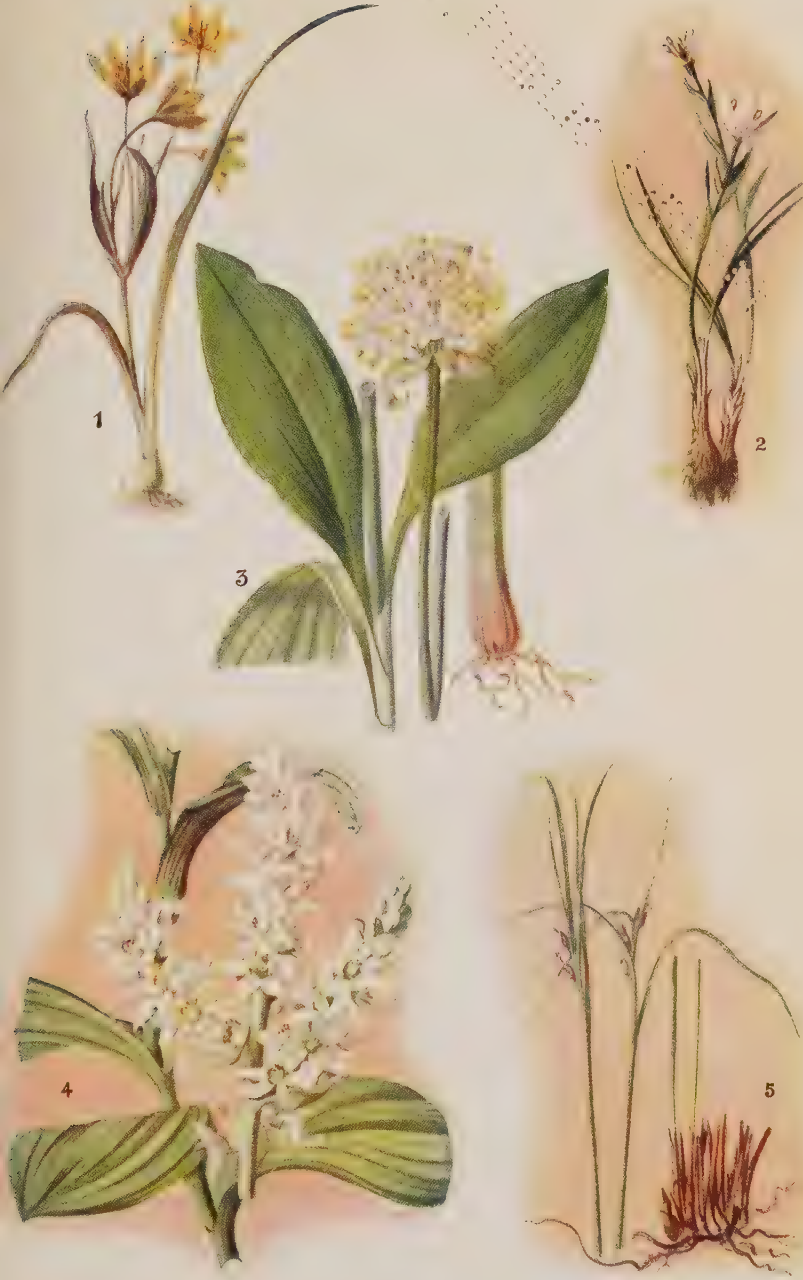

PLATE LXIV.

1. Gagea Liottardi Schult.
2. Lloydia serotina Reichb.
3. Allium Victorialis L.
4. Veratrum album L.
5. Juncus trifidus L.

Tofieldia palustris Huds.

Leaves radical, linear, sword-shaped and stiff, 3-nerved; leaf-stalk without bracts at the base. Flowers small, yellowish, in a spike or raceme at the end of the scape.

Moist Alpine meadows and pastures, 5000–9000 feet.

Distribution.—Eastern and Central Alps, and rarely in the Western Alps (Mont Cenis and Monte Viso), Northern Europe, Arctic regions. (British.)

Tofieldia calyculata L.

Leaves longer, many-nerved. Leaf-stalk hidden by bracts at the base. Stems simple, sometimes a foot high, with a spike of yellowish flowers. Commoner than the last, but not attaining so great an elevation. June to August.

Distribution.—Alps, Jura, Pyrenees, Central Europe.

JUNCACEÆ

Usually stiff herbs with narrow, grass-like leaves and small herbaceous or dry flowers in terminal clusters. Perianth regular, dry and calyx-like, of 6 segments. Stamens 6, or rarely 3. Styles single, with 3 stigmas. Capsule 1 or 3-celled, opening in 3 valves. Seeds small.

A family spread over the whole of the globe.

Juncus L. (Rush)

Leaves stiff and glabrous, usually cylindrical, at least at the tips, or grooved. Flowers usually in irregular panicles, unequally branched, with a dry, sheathing bract under each branch, cluster, or flower. Capsule 3-celled. Seeds numerous.

Nearly 200 species, dispersed over the greater part of the globe.

Juncus trifidus L. (Plate LXIV.)

Rootstock creeping, branched, tufted, forming dense cushions. Stem erect, filiform, 4–10 inches high, filiform, overtopped by the bracts. Leaves linear or almost setaceous, channelled, acuminate, sheathing, ciliated at mouth of the sheath by the slit ligules. Flowers in terminal 1–4 flowered panicles. Perianth-segments acuminate, brown, nearly as long as the brown ellipsoidal capsule. Stamens 6.

Rocky places in the high crystalline Alps up to 8200 feet; local. July, August.

Distribution.—Carpathians, Sudetic Mountains, Eastern, Central, and Western Alps, Pyrenees; Asia, North America. (British.)

Juncus triglumis L.

A small plant, 3–6 inches high. Leaves radical, short and grass-like, sheathing the base of the stem. Flowers brown, in a single terminal cluster of 2–5 (usually 2 or 3). Perianth-segments obtuse, scarious on the edges. Capsule rather obtuse and longer than the perianth.

Mountain bogs and wet places in Alpine pastures up to 8300 feet. July, August.

Distribution.—Alps, Pyrenees, Central and Northern Europe; Asia, North America. (British.)

Juncus Jacquini L.

Stem with a single linear-subulate leaf. Rootstock creeping, with numerous cæspitose tufts of leaves and stems. Leaves terete, fistular, septate. Flowers purple-black, shining, 4–10 in a compact cyme. Perianth-segments lanceolate, acuminate. Capsule oblong, mucronate, black, slightly shorter than the perianth.

Damp, stony places on and above the highest pastures, 6500–10,000 feet. July to September.

Distribution.—Carpathians; Eastern, Central, and Western Alps.

J. filiformis L., *J. alpinus* Vill., and *J. arcticus* Willd. are also found in the high Alpine zone.

Luzula DC. (Wood-rush)

Perennial herbs, differing from *Juncus* in their softer, flatter, grass-like leaves, often fringed with a few long silky hairs, and in their capsules not divided into cells, and containing no more than 3 much larger, erect seeds.

A genus distributed over the northern hemisphere, usually in woods, meadows, or pastures, in drier places than Rushes.

Luzula spicata DC.

A small, slender species, slightly hairy. Leaves narrowly linear. Stem slender, with 1 or 2 leaves, and bearing a terminal spike or cyme of flowers which is often pendent. Flowers dark brown, very small, and with equal, acuminate perianth-segments. Flowers in little clusters, sessile within a short, leafy bract. Fruit nearly black, shining.

High Alpine pastures and damp, stony places up to 8600 feet. June to August.

Distribution.—Alps, Jura, Pyrenees, Norway; Central and Arctic Europe, Asia, Greenland, North America. (British.)

Luzula pediformis DC.

A tall species, 1–2 feet high, rather robust, hairy, with a thick, oblique, scaly rootstock. Leaves broadly linear (4–8 mm.), flat. Inflorescence an oblong, interrupted spike, pendent or horizontal, with a leafy bract exceeding the spike in length. Flowers brown and white, rather large. Perianth-segments unequal, oval, acuminate or mucronate. Capsule brown, ovoid, acuminate, equalling the perianth.

Damp meadows and pastures in the Alps, 6000–8100 feet; rather rare. June to August.

Distribution.—Western Alps (Savoy, Dauphiny, Provence, Piedmont, Mont Cenis), Pyrenees, and Spain.

Luzula spadicea DC.

A very slender, almost glabrous species, with linear leaves and very loose cyme of flowers in clusters on capillary branches. Flowers blackish, very small, with lanceolate, mucronate perianth-segments. Capsule ovoid, mucronate, equalling the perianth.

Damp pastures on granite, and borders of Alpine streams; local up to 8000 feet. July, August.

Distribution.—Eastern, Central, and Western Alps, Pyrenees; Central and Southern Europe from Spain to Bulgaria.

Luzula lutea DC.

From 2–10 inches high. Leaves short, yellowish green and glabrous, linear-lanceolate, shortly acuminate, broad for their length. Cyme in dense clusters, spreading. Flowers pale yellow, sessile. Perianth divisions equal, shortly mucronate. Capsule oval, acute, shorter than the perianth.

Common in damp pastures and on slopes of debris; 5000–9000 feet. July, August. A plant of siliceous soil.

Distribution.—Tyrol, Switzerland, and Western Alps, Pyrenees, Spain.

Luzula flavescens Gaud.

Leaves with silky hairs. Flowers yellowish brown, in ones or twos at the end of very spreading branches forming a loose, terminal cyme.

Shady Fir woods on limestone, and occasionally on the Alps about 4000–6000 feet; local. June, July.

Distribution.—Alps, Pyrenees, Corsica.

Luzula nivea DC.

1–2 feet high or more, bearing a beautiful silver-white corymb of flowers.

Very common in woods, clearings, and subalpine slopes from the plains up to 6000 feet. June to August.

Distribution.—Alps, Jura, Cevennes, Central France, Corbières, and Pyrenees.

Well worth cultivating from seed, which is easily collected.

NAIADACEÆ

Plants usually growing in water. Leaves sheathing at the base, often floating on water. Flowers green, bisexual or unisexual. Perianth 3–4 lobed or 0. Stamens hypogynous. Ovary of 1–4 carpels Style 1. 1 seed in each carpel.

POTAMOGETON L. (Pond-weed)

Leaves floating and opaque or submerged and translucent, stipulate or not. Perianth-segments 4, small, green. Stamens 4.

A rather large genus spread almost all over the globe, but with only one or two representatives in the high Alps.

Potamogeton filiformis Persoon.

Stem branching from the base. Leaves linear-filiform, 1-nerved. Spikes on long stalks. Fruit globular, with very short beak.

Alpine lakes, and rarely lower. It is abundant at the shallower end of the lake of Mont Cenis (6300 feet) and in several Alpine lakes in Switzerland. It flowers in July. Rare.

Distribution.—Southern Tyrol, Switzerland, Western Alps, Central and Northern Europe. (British.)

The writer has a small Potamogeton from the little lake on the Plan du Lac (nearly 8000 feet) in the Tarentaise of Savoy, but the specimen has no fruit and cannot be determined with certainty.

TRIGLOCHIN L.

Triglochin palustre L.

This lowland marsh plant sometimes reaches the Alpine zone. The writer saw it at 8200 feet on the Col du Galibier, and on the Aiguille du Goléon.

CYPERACEÆ

Herbs, often resembling Grasses, but usually stiffer, with solid stems and the sheaths of the leaves closed all round. Flowers in little green or brown *spikelets*, which are either solitary and terminal, or several in a compound cluster, spike, or panicle. Each spikelet is in the axil of a scale-like *outer bract*, and consists of several scale-like *glumes*, each containing 1 sessile flower. Perianth composed of bristles or small scales or none. Stamens usually 3, or sometimes 2. Ovary 1-celled, the style being divided into 2 or 3 linear stigmas. Fruit a small, seed-like nut, flattened when the style is 2-cleft, trigonous when it is 3-cleft.

A large family of at least 2500 species, distributed all over the globe, and especially in moist places and near water. Chiefly represented in the Alps by numerous species of *Carex* (Sedge).

SCIRPUS L.

Rootstock creeping. Spikelets solitary and terminal or in irregular panicles, heads, or clusters. Glumes imbricate. Perianth bristles 1–6 or 0, shorter than the glume. Stamens 3. Fruit a compressed or trigonous nut.

A large genus, widely spread over the globe, many species growing in or near water. Very few attain any height in the mountains.

Scirpus alpinus Schleich.

Rootstock creeping and stoloniferous. Stem 5–12 inches high, glabrous like the whole plant, very slender, simple, stiff, rough to the touch, trigonous, furnished with several sheaths at the base. Spikelet small, 5–6 mm. long, with 8 to 12 flowers. Bracts obtuse, yellowish brown, with a central green nerve. Perianth bristles white. Fruit compressed, trigonous, 1 mm. long.

Marshes and borders of mountain lakes, from the plains up to at least 8100 feet, as e.g. by Lac Savine at Mont Cenis. July, August.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Northern and Western Asia; North America.

Scirpus cæspitosus L.

Stem 6–12 inches high, round, stiff, densely tufted, and covered at the base with several imbricated sheaths, the outer ones brown, the inner ones green, with narrow leafy tips. Spikelet about the size of that in the last species, with 6–8 flowers. Outer bracts obtuse, green, as long as the spikelet. Perianth bristles 4–6, longer than the fruit, which is brown, slightly trigonous, 1 mm. long, mucronate.

Turf bogs and marshes in the plains and mountains up to at least 8100 feet, as by Lac Savine. Often in large quantity. May to August.

Distribution.—Eastern, Central, and Western Alps; Europe, except the Mediterranean coast; Corsica, Algeria, India, North America; Arctic Europe, Asia, and America. (British.)

Scirpus compressus Pers. (*Blysmus compressus* Panzer).

Rootstock creeping, stoloniferous. Stems 6–8 inches high, glabrous, round below, trigonous above, leafy. Leaves grass-like, slightly channelled. Spike terminal, brown, about 1 inch long, consisting of about 10 oblong spikelets, sessile on opposite sides of the axis. Outer bract broad, brown, glume-like, shorter than mature spikelet. Glumes usually 8, imbricated round the spikelet. Stamens 3. Stigmas 2. Bristles 3–6, twice as long as the ovoid, tapering or mucronate nut.

Marshes and wet, grassy places from the plains up to at least 8250 feet, as on the Aiguille du Goléon in Dauphiny. June to August.

Distribution.—Eastern, Central, and Western Alps; Caucasus, Europe, Western and Russian Asia, Himalaya.

ERIOPHORUM L.

Characters and habit of *Scirpus*, except that the bristles finally protrude far beyond the glumes, forming white, silky, or cottony tufts, and hence the English name of Cotton-grass. The style is usually 3-cleft.

Only about a dozen species are known, restricted to the temperate and cold regions of the northern hemisphere. Several are frequent at considerable elevations in the Alps and other mountains.

Eriophorum alpinum L. (Alpine Cotton-grass).

Rootstock creeping, branched, putting up solitary culms, but no tufts of leaves. Stems tufted, 6–10 inches high, with imbricate sheaths at the base, the inner ones with short leafy tips. Spikelets small, brown, and terminal. Glumes obtuse. After flowering the bristles form a white, silky tuft nearly an inch in length. With the exception of these silky hairs the plant closely resembles *Scirpus cæspitosus*, the Tufted Scirpus.

Turfy Alpine and Arctic bogs; local. May to July. In Dauphiny the author has found it as high as 8000 feet.

Distribution.—Carpathians; Sudetic Mountains; Central and Western Alps; Black Forest; Jura; Russian Asia, Arctic Europe, Asia, and America. Extinct in Britain (?), it having formerly been found near Forfar.

Eriophorum Scheuchzeri Hoppe.

A larger and stouter plant, with a dense spherical head of white silky hairs or bristles after flowering. Rootstock creeping, with long stolons. Stems 6–12 inches high, thick, stiff, rounded, with slightly swollen sheaths at the base, and a few radical linear leaves. Scales of the spikelets dark brown edged with white, acuminate. The silky bristles not crinkled as in the last species.

High turfy bogs and wet places by lakes in the Alps; frequently seen at 9000 feet in Savoy; local. June, July.

Distribution.—Eastern, Central, and Western Alps; Pyrenees; Central and Northern Europe; North America.

Eriophorum vaginatum L.

Resembling the last, but taller and with more numerous leaves which are rough at the edges, while those of that species are soft and smooth. The root is not stoloniferous, and the stems are in compact tufts and furnished with broad sheaths at the base, with only a very short blade. Leaves linear, almost subulate, shorter than the stem. Spikelet solitary, terminal, ovoid, of a deep olive-green. Silky bristles very numerous, at length forming white, cottony tufts about an inch in diameter. These tufts are nearly globular, as in the last species.

Turfy bogs and wet places from the plains up to the high mountains. May to July.

Distribution.—Northern and Central Europe; Caucasus; Siberia; North America; common in the British Isles.

Eriophorum angustifolium Roth. (*E. polystachyon* L. part.).

Stem 1–2 feet high. Root creeping, stoloniferous. Leaves few, shorter than the stem, channelled and more or less triangular. Flowers in a terminal umbel of several spikelets, some almost sessile, others stalked and drooping. Outer bracts rather leafy. Silky bristles very numerous, forming oval, cottony tufts 1–1½ inch in length.

Bogs and wet places from the plains up to the lower mountains. Seen by the author at about 8100 feet on the southern slope of the Col du Galibier. May to July.

Distribution.—The commonest species in Europe, Northern Asia, and North America. (British.)

KOBRESIA Willd.

Spikelets few-flowered, in a terminal compressed ovoid spike, rarely branched at the base, with a glume-like bract under each spikelet, the glumes being imbricate. Stamens 3. Stigmas 3. Fruit a trigonous nut.

About 5 species only, inhabiting the mountains and colder regions of the northern hemisphere.

Kobresia bipartita Dalla Torre (*K. caricina* Willd.).

A small Carex-like plant about 6 inches high and forming dense tufts. Leaves radical or sheathing the stems at the base, spreading and much shorter than the stiff stem, grass-like and setaceous. Spikelets 4–8, brown, sessile in a short terminal spike; female below, male above. Fruit an ovate, trigonous nut with a mucro.

Wet places and moors in the high mountains. July.

Distribution.—Alps, Central Pyrenees, Caucasus, mountains of Central and Northern Europe, Asia Minor, North America. Rare in Britain.

ELYNA Schrader

Spikelets 2-flowered, in a terminal cylindrical spike, with a large scale-like bract at the base of each spikelet. Glumes imbricate. Fruit apiculate, trigonous. Closely allied to *Kobresia*.

Elyna myosuroides Fritsch. (*E. spicata* Schrad., *Kobresia scirpina* Willd.).

Resembling the last in size and habit. Sheaths at base of stem yellowish brown, shiny, with channelled limb, which leaves are sometimes as long as the stem. Spike solitary, terminal, and comprising 10–20 spikelets, each spikelet having 1 female flower below and 1 male above; the two flowers together enclosed in an ovate bract. Fruit a brown, obovate, trigonous nut, 2 mm. long, and with no mucro.

Moist places in high mountains and in the highest Alpine pastures. It reaches the summit of the Col de l'Iseran (9080 feet); frequent. July, August.

Distribution.—Eastern, Central, and Western Alps; Corbières, Pyrenees; mountainous Europe, Asia, and North America.

CAREX L.

Monœcious, rarely diœcious herbs, with grass-like leaves, chiefly radical or on the lower part of the stem; mostly perennial. Spikelets solitary or several in a terminal spike, or the lower ones distant, or sometimes forming a short compound spike or panicle. Glumes imbricate. Male flowers with 3 or rarely 2 stamens, but without perianth-bristles. Female flowers enclosed in an inflated sack or *utricle*, contracted at the top, from which projects a style with either 2 or 3 stigmas. Fruit a compressed or trigonous nut enclosed in the perigynium.

A very large genus of about 800 species, spread widely over Europe, Northern Asia, and North America, extending into the mountain ranges of the tropics, and reappearing in the temperate regions of the southern hemisphere. Many species, and most of the large ones, grow in wet places.

In order to correctly determine many kinds, it is necessary to have specimens with more or less ripe fruit.

In the European Alps about 20 species reach the upper limit of Alpine pastures, or about 8000 feet; and at least another score are found between 5000 and 7000 feet. At Mont Cenis alone the author collected 33 species of *Carex* from above 6000 feet in July and August, 1907. It is probable that in the whole of Switzerland so large a number could not be found at that height, though Switzerland yields about 88 species and sub-species, or a few more than are found in the British Isles.

In the present work it is only possible to give brief descriptions of several of the most characteristic Alpine species.

Carex rupestris All.

Rootstock creeping. Stems 3–8 inches high, erect, slender, triangular, with solitary and terminal spikelets of male (above) and female flowers. Stigmas 3. Glumes of female flowers ovate, persistent. Fruit obovoid, not pointed. Leaves in loose tufts, ending in a long, fine point, shorter than the stems.

Rocks and wet, stony places in high mountains. July, August. Collected by the author at 9000 feet on the Goléon.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, mountains of Northern and Arctic Europe and Asia; Scotland.

Carex baldensis L.

Stem 6–12 inches high, rather weak. Leaves linear, furrowed, acute. Spikelets monœcious, the upper part male, united into a hemispherical, whitish head, with long, horizontal involucral bracts. Stigmas 3. Glumes ovate, whitish. Fruit elongated, obtuse, with a very short beak. A very distinct species.

Alpine pastures and stony places at about 5500 feet, and in woody regions of the lower Alps; rare. May, June.

Distribution.—Eastern Alps (Upper Bavaria, Southern Tyrol, and Salzburg). In Switzerland only near the Ofenpass and elsewhere in Grisons. Monte Campione above Lake Como.

Carex fœtida All.

Rootstock tufted, thick. Stem erect, triangular, scabrous, naked, about as long as the leaves, which are flat, rough at the edge, and rather broad. Spikelets forming a compact globular or ovoid, dark brown head, with the male flowers above. Glumes oval, acute, mucronate. Stigmas 2. Utricles ovate-lanceolate, with a long bifid beak. Fruit ovoid, biconvex.

Wet pastures and flat places where water stands in the high Alps. July to September. Frequent at heights of 8000 and even 9000 feet in some of the Western Alps, occasional in Switzerland, and very rare in the Eastern Alps.

Distribution.—Southern Tyrol, Salzburg, Switzerland, Western Alps, Pyrenees.

Carex incurva Lightfoot.

Rootstock creeping. Stems round, thick, only 2 or 3 inches high, often curved as well as the rush-like leaves, which are also short like the stem. Spikelets 3 or 4, packed into a more or less globular brown head, each spikelet having a few male flowers at the top. Stigmas 2. Fruits rounded oval, lengthened into a short beak extending beyond the glumes.

Damp Alpine pastures and marshes; rare. July, August. Found by the author in various places from 6000–9000 feet in Savoy, Dauphiny, and Piedmont.

Distribution.—Rare in Switzerland (Dent de Morcles and Saas-im-Grund, H.S.T.); Western Alps; Central and Arctic Europe and Asia; North America; Scotland.

The above plant was called *Carex juncifolia* by Allioni in 1785 because of the rush-like leaves, but Lightfoot's name was eight years earlier.

Carex curvula All.

Rootstock tufted and cæspitose, forming a dense matted tuft, with fibrous roots. Plant quite glabrous, 4–12 inches high. Stems rounded, naked except at the base, sometimes curved. Leaves in bundles, linear, setaceous, rough at the edge, usually all curved on one side, enclosed in broad, fawn-coloured sheaths at the base. Spikelets 3–6, forming a dense oval or oblong, light brown spike, the male flowers being at the summit. The spike is terminal, as in the others hitherto described. Stigmas 3. Inferior bract large, oval, aristate. Fruits brown, trigonous, furnished with a linear scale on the inside.

Rocks and grassy spots in high mountains, sometimes abundant, and especially on siliceous soil. Frequent between 6500 and 9500 feet. July, August.

Distribution.—Eastern, Central, and Western Alps; Carpathians, Transylvania, Balkans, Pyrenees, Hautes-Corbières. Commoner in the Western than Eastern Alps.

Carex atrata L. (Black Sedge). (Plate LXIII.)

Rootstock with short stolons, rather tufted. Stem erect, triangular at the summit, naked above, leafy at the base, less stiff than in *C. nigra*. Leaves rather broad, usually shorter than the stem, flat, sheathing at the base. Inflorescence drooping, composed of 2–4 ovate or cylindrical, dense-flowered, blackish spikelets, which are shortly stalked, the lowermost stalk being usually longer. The terminal spikelet is female in the upper, male in the lower part; the others are usually female only. Bracts membranous, often ending in a herbaceous point; outer bract leaf-like, linear, longer than the spike, with only a short sheath or sometimes none. Glumes purple-black, with paler margin, ovate-lanceolate. Stigmas 3. Fruit usually dark brown, not nerved, obovate or elongated, compressed, glabrous, with very short beak.

High Alpine pastures and damp rocky and stony places in humus; 6000–9000 feet; common. July, August.

Distribution.—Eastern, Central and Western Alps; Carpathians, Sudetic Mountains, Balkan Mountains, Pyrenees, Caucasus, Himalaya, Siberia, North America; rare in Britain; Scandinavia and Arctic Europe, Asia and North America.

Carex atrata L. must be distinguished from both *C. nigra* All. and *C. aterrima* Hoppe, both of which grow in somewhat similar places, and indeed Schinz and Keller reduce them to sub-species of *C. atrata*. At any rate, that Sedge occupies an intermediate position, and *C. aterrima* may be but a tall edition with from 3–7 spikes, which does not ascend so high in the Alps, but usually enjoys an altitude of about 6500 feet, and is sometimes seen on the borders of Pine woods.

Carex nigra All.

Although in structure this does not differ much from *C. atrata*, yet the habit is so much stiffer and shorter, and the flowering spikelets are always sessile and erect, that it seems still worthy of specific rank. The spikelets are oval, blackish, quite sessile and erect, and shorter than in *C. atrata*. The 3–5 spikes together form a dense sub-globular head, the male and female flowers being arranged as in the last. The utricles are purple-black, but with a paler yellowish border.

High pastures and rocky places in the mountains; local. July, August. 5000–9000 feet in the Western Alps.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Caucasus, Central and Arctic Europe.

Carex bicolor All.

A very small, strictly Alpine species, 2–6 inches high, glabrous and with a shortly stoloniferous rootstock. Leaves shorter than the stem, narrow (1–2 mm.), rough at the edge, flat. Inflorescence drooping, composed of 2–4 small, thick, obovate spikelets, which are brown variegated with light green, on short stalks; the terminal spikelet composed of male flowers only in the lower part. Bracts reddish black, with green nerve, shorter than the greenish white utricles, which are small and obovate.

Swampy places and borders of small lakes in high mountains; 6000–8000 feet; especially on primary formations; local. July, August.

Distribution.—Eastern, Central, and Western Alps, Central Pyrenees; Central and Arctic Europe; Greenland, Labrador.

Carex capillaris L.

A small, slender plant 3–6 inches high, with extremely slender, rounded stems scarcely longer than the leaves. Terminal spikelet male, small. Female spikelets 2 or 3, lower down, on long capillary peduncles, so that they are nodding, distant, and lax. Female spikelet of 5–10 flowers, but the spikelet is very small and short. Bracts shortly leafy, the lower bract having a long sheath. Glumes scarious at the margins. Stigmas 3. Fruit trigonous, not nerved, tapering into a short beak.

Damp and sandy Alpine pastures, borders of springs, and wet rocks in the Alps and sub-Alps, up to 8200 feet at least. July. Often growing with other Carices.

Distribution.—Eastern, Central, and Western Alps; Pyrenees, Caucasus, Arctic Europe, and Asia; North America, North Britain.

GRAMINEÆ (The Grass Family)

Herbs with usually hollow stems, except at the nodes, and narrow, parallel-veined, entire, alternate leaves, sheathing at the base; but the sheaths usually split open on the side opposite the blade, and end in a small appendage called a *ligule*. Flowers in *spikelets*, arranged in spikes, racemes, or panicles. Each spikelet generally consists of 3 or more chaff-like scales or bracts called *glumes*, arranged alternately, with their concave face towards the axis. The 2 lowest glumes are usually empty, but the *flowering glumes* enclose a smaller scale called a *palea*, which usually has 2 longitudinal veins or ribs. The flower is within the palea, or between it and the flowering glume. The true flower usually consists of 2 almost microscopical scales called *lodicules* and of 3 stamens (rarely 6) and of an ovary with 1 cell and 1 ovule, crowned by 2 more or less feathery styles. However, the *flower* is generally considered to include the flowering glume and the palea. The fruit is a 1-seeded *grain*, consisting of the real seed and pericarp, and is either free or enclosed. The embryo or germ is small, at the base of a mass of mealy albumen.

Several other points will arise in any extended and exact study of this large and somewhat difficult family—the Grasses are distinctly more difficult than the Sedges, and they require careful dissection—but the outline indicated above is sufficient for the purpose of the average botanical student.

Gramineæ is one of the largest families, its representatives being spread throughout the globe. At least 4000 species are known to science. Among the greatest authorities upon Grasses in the world are Professor Hackel, Dr. Otto Stapf of Kew, and Dr. A. B. Rendle of the British Museum of Natural History.

Grasses are found from the burning plains of the equator towards the poles as far as any Phanerogams have been seen, and from the coast up to the summits of some of the highest mountains. In temperate regions they form the chief green carpeting of the soil; while in tropical regions some species of Bamboo attain the height of tall trees. In every country grasses are cultivated, as cereals, for food: wheat (*Triticum*) in Europe, in Africa, in North and South America, as well as in India and Australia; rice (*Oryza*) in India, China, and Japan; maize (*Zea Mays*) in South America and on the prairies of the Mississippi; rye (*Secale*), oats (*Avena*), and barley (*Hordeum*) in the mountains and in the countries of the North.

Three varieties of Barley were found in lake dwellings in Switzerland, in deposits of the Stone Period, thus tending to show that the opinion of Pliny was well founded in saying that Barley was the most ancient aliment of mankind.

About 70 species of true Grasses are found in the high Alps of Central Europe, and many of these extend above 8000 feet in that district. They mostly belong to the following genera, viz. *Phleum*, *Agrostis*, *Avena*, *Sesleria*, *Trisetum*, *Poa*, and *Festuca*. Let us describe one Alpine representative of each of these characteristic genera.

PHLEUM L.

Phleum alpinum L.

About a foot high, glabrous. Stem erect, rather leafy, especially at the base; the sheaths of the upper leaves loose and inflated. Ligule short, truncate. Spike oblong or oval, dense, short, rarely an inch long, usually purplish. Outer glumes truncate, but with a hispid keel lengthened into an awn. No rudiment of second flower.

Alpine pastures and subalpine meadows; up to 9000 feet in the Western Alps of Savoy (Col de la Leisse). Frequently also by mountain lakes; common. June to August.

Distribution.—Mountains of Northern and Arctic Europe, Asia, and America; mountains of Central and Southern Europe, including the Alps, Carpathians, Pyrenees, and Caucasus; Altai, Antarctic America; Scotch Highlands.

AGROSTIS L.

Agrostis rupestris All.

Rootstock tufted, covered with fibres below. Stems erect, slightly bent at the nodes, glabrous like the whole plant, 3–12 inches high. Root-leaves crowded, short, bristly; stem-leaves similar or somewhat flatter; ligule lanceolate. Panicle ovate or elliptical, spreading, violet. Branches smooth. Spikelets ovate-lanceolate, small (2 mm.). Glumes nearly equal in length, pointed. Flowering glume awned below the middle, the awn being twice as long as the glume. Palea often wanting.

Rocky pastures in high mountains. July, August. Grows in similar places to *A. alpina* Scop., with which it is sometimes confused. Both are frequently seen in the Western Alps between 8000 and 9000 feet, and the former reaches about 10,000 feet in Dauphiny.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Black Forest, Auvergne, Pyrenees, Corsica.

AVENA L. (Oat)

Avena versicolor Vill.

A glabrous grass, from 8–20 or more inches high, according to situation. Rootstock somewhat tufted. Leaves green, short, flat, obtuse, more or less shiny on both sides, edged with white. Ligule long, lanceolate. Panicle short (3–6 cm.), oblong, tinged with green, violet, and yellow. Spikelets erect, about 15 mm. long, usually with 5 flowers in each. Glumes unequal, tapering to a point, shorter than the flowers, 3-nerved. Inner or flowering glumes unequal, 2-cleft at the top, each lobe tapering, and furnished with a long, bent awn on the back of the glume.

Pastures and grassy or stony places in high mountains, from 5800–9800 feet. July, August. Not to be confused with *A. montana* Vill., of similar places and heights.

Distribution.—Carpathians, Alps, Pyrenees, Auvergne, Transylvania, Caucasus, Altai, North America.

SESLERIA Scop.

Sesleria disticha Pers.

Stems 4–8 inches high, cæspitose. Rootstock fibrous. Leaves in radical tufts, curved in at the margin, setaceous or bristly. Ligule lanceolate. Panicle short, ovoid, somewhat unilateral. Spikelets disposed in two rows, 3–5 flowered, sessile, without any bract at the base of lower spikelet. Exterior glumes broad, oval, with a very short mucro, streaked with blue, yellowish and membranous at the margins. Flowering glumes 2 in each spikelet. Palea with 2 keels, ciliated.

Rocks and on humus of high siliceous mountains, from 6000–9500 feet; local. July, August.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees, Bavaria.

TRISETUM Pers.

Trisetum spicatum (L.) Richter (*T. subspicatum* Beauv.).

Stems 2–10 inches high, from a tufted rootstock, thick, erect, covered with downy tomentum above. Leaves short, flat, channelled later. Ligule short, truncate. Panicle ovate or oblong, not an inch long, very dense, tinged with violet, green, and yellow. Spikelets about 5 mm. long, 2–3 flowered, with a tuft of hairs at base of each outer glume. Glumes equal, broad, the lower glume 1-nerved; flowering glumes furnished with 2 very short bristles and a dorsal, bent awn twice the length of the glume.

Glacier moraines, debris, and rocky pastures in high mountains, especially on slate; 7000 to about 12,000 feet. Seen by the author on the Aiguille du Goléon at 11,200 feet, and frequently elsewhere at 9000 feet; local. July to September.

Distribution.—Eastern, Central, and Western Alps; Central and Eastern Pyrenees, Arctic regions, etc. A local but widely spread and very characteristic grass.

POA L.

Poa alpina L.

Stems 6–12 inches high, tufted, often somewhat swollen at the base. Leaves short, rather broad, chiefly radical, with a short, inflected point. Ligules broadly truncate. Panicle 1–2 inches long, erect, spreading, with short, slender branches. Spikelets ovate, crowded, 3–5 flowered, often purple or variegated. Outer glumes pointed. Flowering glumes pointed and keeled, with a few small silky hairs on the edges. Somewhat polymorphic and very variable in size, according to habitat. The spikelets are very often transformed into leafy shoots or bulbils, this form being the variety *vivipara* L., it being quite frequent in the British Isles as well as on the Continent.

Alpine pastures from 3000 feet to at least 9000 feet. It has been recorded as high as 3617 metres on the Weissthor in Switzerland. Very common and widely spread. June to August.

Distribution.—Higher mountains of Europe, Asia, Algeria, and North America; Arctic regions (British).

There are other species of *Poa* which, though much less common, are usually found at higher altitudes, but also in more restricted zones of elevation than *P. alpina*. They include *P. cæsia* Sm., *P. cenisia* All., and *P. laxa* Haenke (British); but all the small Alpine species are very difficult to determine.

FESTUCA L.

Festuca alpina Suter.

Root fibrous. Stems 4–10 inches high, leafy at the base. Leaves setaceous, folded or channelled, smooth, shining, forming rigid, loose tufts. Ligule 2-auricled. Panicle spreading when in flower, unilateral. Spikelets with 3–5 flowers, elliptical, pale green or violet; lower spikelets shortly stalked. Outer glumes lanceolate. Flowering glumes awned or not. Awn, when present, varying in length. Palea 2-fid, hairy on the nerves.

Dry, rocky declivities and Alpine pastures, from 6000–8500 feet, especially on limestone and schistose formations; common. June, July.

Distribution.—Carpathians, Eastern, Central, and Western Alps; Pyrenees, mountains of Central Europe.

Festuca alpina is frequently seen in the viviparous form, like *Poa alpina.*

Festuca Halleri All. is a very similar grass found at like altitudes, but usually on siliceous formations. The spikelets are violet-brown or pale plum colour; the flowering glumes narrow, tapering into an awn nearly as long as the glume. Outer glumes unequal, acuminate.

Distribution.—Eastern, Central, and Western Alps; Pyrenees; Corsica; Servia, Himalaya.

Stipa L.

Stipa pennata L.

This is the grass which bears the very long plumose awns, which Swiss and Austrian guides sometimes wear in their hats. The feathery awns are 8 or 10 inches long, twisted or spiral below, and the seed at the base is thus carried by the wind.

Though frequently seen at considerable elevations in the Alps, this interesting grass is found in dry, arid places throughout Central and Southern Europe, and in Western Asia and N. Africa. It even grows in the neighbourhood of Paris. In gardens it likes a sandy loam, and is easily grown from seed.

CLASS III. GYMNOSPERMÆ

CONIFERÆ

Trees or shrubs with resinous juice, and usually rigid, subulate leaves, often in fascicles and entire in the European genera. Flowers monœcious or diœcious. Male flowers in catkins, of 1 or more anthers, female flowers solitary or in cones of 1 or more sessile, naked ovules, placed on a bract or open carpellary leaf. Fruit a cone or berry.

An extensive family spread over the whole globe.

PINUS L.

Trees with linear or subulate, fascicled leaves. Male catkins in spikes of many 2-celled anthers. Cone ripening the second year. Ovules 2, inverted and adnate to the carpellary leaf.

Pinus montana Miller (*P. Mughus* Scop.). (Plate LXII.)

Leaves narrowly linear, flat or channelled on the upper side, convex below, mucronate, scarcely acicular, in pairs within a sheath, persistent. Male catkins long, congregated in whorled spikes at the base of this year's shoots. Female catkins oval or longer, solitary, or 2–6 together, in the first year at the apex of this year's shoot, in the second year lateral from the growth of a new shoot, erect during and after flowering, spreading obliquely or horizontally when ripe, sessile. Scales nearly as long as the carpellary leaves at the time of flowering, and more or less concealing them. Cones ovate or ovate-conical before opening. Scales of cone variously spathulate, compressed, 3-sided; shield within an irregularly 4-cornered or nearly 3-cornered beak.

A tree, with shorter trunk and prostrate or ascending branches in the form known as *P. Mughus*, often covering large tracts in rocky Alpine slopes; 4400–7500 feet. May, June.

The short form is more especially found on limestone.

Distribution.—Carpathians; Eastern, Central, and Western Alps; Jura, Vosges, Pyrenees, Caucasus; Central and Eastern Europe.

P. uncinata Ramd. is perhaps only a variety of the above.

Pinus Cembra L. (Arolla or Siberian Stone Pine)

Stem erect. Leaves in bundles of 3–5, stiff. Cones of this year erect, in groups of 3 or 4 at end of branches, stalked; when ripe, large, sessile, ovate, obtuse. Scales flat, erect, downy, rather spreading at the apex. Shield very small, almost obsolete. Seed not winged. A tree of moderate size. Leaves bluish green when young, bluish white on both sides of the mid-nerve on the upper surface. Cones solitary or in twos or threes, attaining the size of the fist, dark violet-brown. The seeds are eaten in the Eastern Alps under the name of " Zirbelnuss."

Alps from 4400–8000 feet (extreme limits). May, June. Local.

Distribution.—Carpathians ; Eastern, Central, and Western Alps, Central and Northern Europe, Siberia. In Switzerland in the Pennine chain from the Dranse to the Simplon, the Bernese Oberland, and Engadine. It is often associated with the Larch. There are proofs of more elevated ancient limits in many localities.

Pinus sylvestris L. (Scotch Pine)

Cones very shortly stalked, recurved when young, symmetrical, conical. Scales rhomboid, with a transverse keel and deciduous point. Leaves in pairs, stiffly subulate, about 2 inches long.

This well-known Pine reaches about 7300 feet in the Swiss (Valais) Alps, where it is rare, and possibly rather higher in some of the Western Alps of France and Italy.

ABIES Miller (Fir).

Characters the same as those of *Pinus*, but the leaves are solitary and evergreen.

Abies excelsa Poir. (Spruce Fir) (*Picea excelsa* Link).

Leaves mucronate, somewhat 4-edged, green. Cone cylindrical (10–15 cms.), pendulous, without bracts. Scales dentate, sessile, and persistent.

In Switzerland it reaches from the plains to the upper limit of trees (1650–1980 metres), except in Tessin, the Grisons and the Valais, where the Larch and the Arolla Pine (*P. Cembra*) are the highest trees (Schinz).

Distribution.—Eastern, Central, and Western Alps; Jura, Vosges, Central and Northern Europe, Siberia. Very often planted.

Abies alba Miller (*A. pectinata* DC.) (Silver Fir).

Leaves pectinate, 2–5 cms. long, with 2 white lines beneath. Cone cylindrical, reddish violet first, then green, erect, shorter than in *A. excelsa* (8–10 cms.), with prominent bracts. Scales dentate, shortly petioled, and falling with the seeds.

According to Schinz and Wilczek it reaches a height of 1800 metres in Switzerland, and forms great belts of forest from about 1000–1600 metres, and to 1300 metres in the Jura.

Distribution.—Eastern, Central, and Western Alps; Vosges, Jura, Pyrenees, Corsica; Central and Southern Europe, Caucasus, Asia Minor.

LARIX Miller (Larch).

Leaves fascicled, deciduous. Seeds winged.

Larix europæa DC. (*L. decidua* Miller)

A tree sometimes attaining a height of 160 feet. Leaves or needles in fascicles of 20–30, slightly channelled, deciduous, bright green, turning yellow-ochre in autumn. Cone ovoid, erect, reddish purple when young, grey-brown when mature, 3–4 cm. long, with persistent scales.

This most useful timber tree reaches 2400 metres (7870 feet) in Switzerland and the Western Alps, the extreme limit of trees, and is almost totally absent from the Jura and sub-Alps.

Very fine specimens can be seen just above Saas Fee in Switzerland. They have been photographed by Mr. Ballance, and can be purchased in his fine series.

Distribution.—Eastern, Central, and Western Alps; Central Europe. Elsewhere planted.

JUNIPERUS L.

Shrubs with glaucous, subulate, stiff and pointed or scale-like leaves. Cone berry-like, small, composed of fleshy scales, blue when ripe (in the second year). Ovules 1 or 2 under each scale, erect. A genus spread over the northern hemisphere.

Juniperus communis var. *montana* Aiton (*J. nana* Willd.)

A rather prostrate shrub, with 3 acicular linear leaves in a whorl, 4–8 mm. long, imbricate, and ' berries ' as large as Bilberries or larger.

Widely spread in the Alps from 5500–8200 feet, and very occasionally as high as 11,500 feet in Switzerland, which gives it the distinction of being the highest woody plant in Europe. It flowers in June and July.

Distribution.—Carpathians, Alps, Jura, Auvergne, Pyrenees, Corsica; Arctic Europe and Asia, Himalaya, and North America. (British.)

Juniperus Sabina L.

Leaves like small rhomboid, imbricated scales in 4 rows, or acicular, broadly subulate and spreading. Cone or ' berry ' on a short recurved stalk, not so dark in colour as the other. Bark of the branches reddish brown.

Dry, stony places up to 8200 feet. Flowers in April and May. It is a characteristic shrub of some of the hot Alpine valleys and Pine forests in the South of Switzerland.

Distribution.—Eastern, Central, and Western Alps; Jura, Pyrenees, Caucasus, Siberia, North America.

CLASS IV. VASCULAR CRYPTOGAMS

The Ferns and Fern allies which are frequent in the Alpine region include *Selaginella, Lycopodium* spp., *Botrychium* spp., *Athyrium alpestre, Aspidium Lonchitis, Cystopteris fragilis, C. alpina, C. montana, Asplenium* spp., *Allosorus crispus*, and *Woodsia*.

In Switzerland alone there are only about forty-five true ferns (excluding *Botrychium* and *Ophioglossum*), or just about the number to be found in the British Isles.

LIST OF THE FERNS OF SWITZERLAND,
based on the arrangement of Schinz and Keller.

POLYPODIACEÆ

Athyrium Filix femina Roth.
A. alpestre Rylands.
Cystopteris fragilis Bernhardi.
Sub-species *regia* Bernoulli.
C. montana Desv.
Dryopteris Phegopteris C. Christensen.
D. Linnæana C. Christen.
D. Robertiana C. Christen.
D. montana O. Kuntze.
D. Thelypteris A. Gray.
D. Filix mas Schott.
D. rigida Underwood.
D. cristata A. Gray.
D. spinulosa O. Kuntze.
Sub-species *dilatata* C. Christen.
D. Lonchitis O. Kuntze.
D. aculeata O. Kuntze.
Sub-species *lobatum* Schinz et Thellung.
Sub-species *angulare* Schinz et Thellung.
D. Braunii Underwood.
Onoclea Struthiopteris Hoffm.
Woodsia ilvensis Bab.
Sub-species *rufidula* Aschers.
Sub-species *alpina* Gray.
Blechnum Spicant With.

Phyllitis Scolopendrium Newman.
Asplenium Ceterach L.
A. fontanum Bernh.
A. Trichomanes L.
A. viride Hudson.
A. septentrionale Hoffm.
A. Adiantum nigrum L.
Sub-species *nigrum* Heufler.
Sub-species *Onopteris* Heufler.
A. germanicum Weis.
A. Ruta-muraria L.
Pteridium aquilinum Kuhn.
Pteris cretica L.
Allosorus crispus Bernh.
Adiantum Capillus Veneris L.
Notholæna Marantæ R. Br.
Gymnogramme leptophylla Desv.
Polypodium vulgare L.
Sub-species *serratum* Willd.

OSMUNDACEÆ

Osmunda regalis L.

There are also seven species of *Botrychium* (Moonwort) found in Switzerland alone. It will be observed that the above list of Swiss ferns comprises *Pteris cretica*, a Mediterannean species which is found in Tessin ; the Southern *Notholæna Marantæ*, occasionally seen on walls in the same Canton ; the widely-spread *Gymnogramme leptophylla*, which again the land of the Ticino has produced ; and the German fern, *Onoclea Struthiopteris*, which occurs in two or three districts in Switzerland and reappears on the slopes of Monte Viso.

A GLOSSARY OF BOTANICAL TERMS

Achene, a dry, indehiscent, 1-seeded fruit, such as the single 'seed' of a *Ranunculus*.

Acicular, applied to linear leaves which are stiff and needle-like, such as those of Pine.

Acuminate, suddenly narrowed at the top and then prolonged into a point.

Acute, tapering to a point.

Adhesion, the union of dissimilar parts of a flower, such as the petals and sepals; cf. Cohesion.

Adventitious roots, those which appear as outgrowths from the stem or leaves.

Æstivation, the arrangement of the petals in the unexpanded bud.

Alternate, applied to leaves which are not arranged opposite to one another on the stem.

Amplexicaul, when a leaf, bract, or stipule more or less embraces the stem.

Andrœcium, the male organs or stamens, considered as a whole.

Angiosperm, a Flowering Plant whose ovules are enclosed in ovaries; cf. Gymnosperm.

Annual, applied to plants which pass through their life-history in one year and then die.

Anther, the upper portion of a stamen containing pollen.

Apetalous, without petals, or with very small rudimentary ones.

Aquatic, growing actually in water.

Arillus, a dry covering of some seeds.

Aristate, when the point of a leaf is fine like a hair.

Articulate, jointed, applied to organs which can be separated (without tearing) into several similar parts, e.g. an articulated capsule.

Ascending, applied to stems which are first prostrate and then rise more or less vertically.

Asexual, applied to the reproduction by organs other than the stamens and carpels.

Association, a colony or community of plants living together.

Awn, a thread-like extension of a seed or other organ, such as in Barley or in *Anemone alpina*.

Axil, the angle formed, for example, at the attachment of a leaf to a stem.

Axillary, growing in an axil.
Axis, usually applied to the stem.

Beak, sometimes applied to the curved and pointed extremity of a fruit; or the hooded portion of a corolla, such as *Pedicularis*.
Biennial, requiring two years to complete its life-history, after which the plant dies.
Bifid, 2-cleft.
Bipinnate, twice-pinnate; e.g. the leaflets of *Osmunda*.
Bipinnatifid, applied to pinnate leaves whose segments are doubly cut or lobed; e.g. *Matricaria*.
Bract, a small leaf at the base of a flower-stalk; or the divisions of an involucre.
Bud, the unopened leaf or flower.
Bulb, a modified stem, usually subterranean, consisting of a series of succulent leaves containing reserve material, such as an Onion.
Bulbil, a bud which falls from certain flowers or leaves and is capable of reproducing the plant, as in some Alliums and Lilies.

Cæspitose, tufted, when stems are very short, close and many together.
Calcicole, applied to plants which thrive best on calcareous, or limestone, soils.
Calcifuge, applied to plants which avoid calcareous soils.
Calyx, the sepals considered as a whole.
Campanulate, in the form of a bell.
Capillary, hair-like; very fine, but hollow.
Capitulum or Head, an inflorescence in which the flowers are stemless, and arranged on a terminal expansion of the axis; e.g. many *Compositæ*.
Capsule, a dry seed-vessel containing many seeds and composed of two or more carpels.
Carpel, an ovary with its style and stigma.
Carpophore, a small support to the capsules of certain plants, as in many Silenes.
Cartilaginous, of the consistence and colour of cartilage; e.g. the border of many Saxifrage leaves.
Catkin, a dense spike of unisexual apetalous flowers, which are shed as a whole.
Cells, the units of which plant or animal tissue is built up.
Cellular, composed of cells.
Chlorophyll, the green colouring-matter of plants.
Ciliated, fringed with longish hairs or cilia.
Circinate, curled up.
Claw, the narrowed part at the base of a petal.

Cleistogamous flowers are those which never open and are self-fertilised; very rare among Alpine plants.
Club-shaped, cylindrical, but becoming larger towards the base.
Cohesion, the union of similar parts of a flower; cf. Adhesion.
Cone, the scaly fruit of the *Coniferæ* or Pine family.
Conical, cone-shaped.
Coniferous, applied to the Pine and Fir family, which bear cones.
Convolute, rolled together.
Cordate, heart-shaped.
Coriaceous, firm and tough like leather.
Corm, a bulb-shaped, modified and swollen underground stem, in which reserve material is stored; e.g. a Crocus corm.
Corolla, the petals of a flower considered as a whole.
Corona, a circular rim within the corolla or perianth, such as the 'trumpet' of a Daffodil.
Cotyledons, the first pair of seed-leaves.
Crenate, applied to leaves with obtuse, rounded teeth, such as those of Violet and Ground Ivy.
Cryptogamic, plants reproduced by spores, like Ferns and Mosses, in which the stamens and pistils are wanting.
Cuneate or Cuneiform, wedge-shaped; i.e. broadest above the middle and tapering towards the base.
Cuspidate, imperceptibly lengthened into a sharp point.
Cuticle, the outer skin of an animal or plant.
Cyme, an inflorescence in which the flowers are produced in successive, lateral axes; e.g. *Myosotis*, *Lychnis*.

Deciduous, applied to plants, and especially trees, whose leaves are shed each autumn.
Decurrent, applied to leaves which run down the stem.
Dehiscent, applied to fruits which open at one or more points to allow the seed to escape.
Dichotomous, applied to a stem, branch, panicle, or cyme which is forked again and again.
Dicotyledon, a plant having two seed-leaves; cf. Monocotyledon.
Digitate leaves are those whose lobes are disposed like the fingers of the hand, but from one centre, as in Lupine.
Diœcious plants are those having stamens and pistils in separate flowers on different plants.
Disc, the central part of a capitulum of *Compositæ*; also the glandular space above the receptacle of some flowers.
Drupe, a fleshy, indehiscent fruit containing one seed; e.g. a cherry.

Ebracteate, without bracts.
Ecology, the study of plants in relation to their environment.
Elliptical, in the form of an oval with both ends tapering alike.
Emarginate, notched; usually applied to petals.

Endemic, peculiar to a district or country.

Endosperm, the store of food outside the embryo in certain seeds, and absorbed by it in germination.

Entire, applied to leaves which are not cut or toothed.

Epicalyx, the outer portion of a double calyx ; e.g. in *Dryas* and *Potentilla*.

Epipetalous, applied to stamens borne upon petals.

Epiphyte, a plant which grows upon another, but not as a parasite. Lichens and many Orchids are epiphytes.

Evergreen, applied to plants with green foliage all the year, and to leaves which last more than one season.

Exalbuminous seeds have no endosperm, and the embryo occupies the whole cavity.

Exstipulate, having no stipules.

Falcate, sickle-shaped.

Family = Natural Order ; a group of genera of greater or less affinity.

Fascicled, in bundles or tufts.

Filament, the slender stalk of a stamen.

Filiform, long and slender or thread-like.

Fistular, cylindrical and hollow, like many umbelliferous stems.

Flaccid, limp or flabby.

Flexuose, bent more or less in a zigzag.

Follicle, a carpel or seed capsule dehiscing longitudinally at the inner suture ; e.g. *Helleborus*, *Aconitum*.

Free, not united.

Fruit, the seed or group of seeds with its whole covering.

Fusiform, spindle-shaped.

Gall, a growth caused by an insect or fungus ; e.g. an 'Oak apple.'

Gamopetalous flowers have the petals all united, as opposed to polypetalous.

Genus (plural genera), a group of species of greater or less affinity.

Gibbous, swollen at the base.

Glabrous, without hairs.

Gland, an organ of secretion.

Glandular Hairs are those with enlarged apices containing a secretion, as in *Drosera* or *Arnica montana*.

Glaucous, covered with a pale bluish green bloom.

Globose, spherical.

Glume, the bract which encloses the spikelet in Grasses and Sedges.

Glumella or **Glumule**, the bract which forms the exterior covering of each flower of a spikelet in Grasses.

Gymnosperm, a flowering plant whose ovules are not enclosed in carpels. The *Coniferæ* are the chief Gymnosperms.

GYNŒCEUM, the carpels or female organs of a flower considered as a whole.

HABIT, the outward form, shape, or build of a plant.
HABITAT, the kind of locality in which a plant grows. Not the locality itself, which may be called a station.
HASTATE, halbert-shaped.
HERBACEOUS, not woody.
HERMAPHRODITE, or bisexual flowers, have both stamens and pistils present.
HISPID, bristly, thickly covered with stiff hairs.
HONEY, the nectar secreted by many flowers to attract insects.
HUMUS, organic matter in the soil, more or less decomposed.
HYBRID, a cross between two species.
HYPOGYNOUS flowers have the calyx and corolla borne on the receptacle, and the ovary is superior.

IMBRICATED, overlapping like the tiles of a roof, such as the leaves of *Gentiana imbricata*.
INDEHISCENT fruits are those which do not open to allow the seed to escape.
INDIGENOUS, native, not introduced.
INFERIOR, applied to the ovaries of flowers whose calyx-tube encloses the ovary ; cf. Superior.
INFLORESCENCE, the manner in which flowers are arranged on the main stem or on lateral branches.
INSECTIVOROUS plants are those which absorb nutriment from flies and other insects.
INTERNODE, the portion of a stem between the attachment of two alternate leaves.
INVOLUCEL, the involucre of a partial umbel.
INVOLUCRE, the whorl of bracts below an inflorescence or below a single flower.
IRREGULAR, unequally divided.

KEEL, the two lower united petals of Leguminous flowers ; keeled is also applied as an adjective to certain leaves.

LABELLUM, the lower lip of Orchids, Labiates, etc.
LACINIATE, when leaf-lobes are narrow and very irregular.
LAMINA, the blade or broad part of a leaf.
LANCEOLATE, tapering at both ends, but more so at the upper end ; a somewhat comprehensive term applied to leaves, etc., which are about three or more times as long as broad.
LIGULATE, strap-shaped.
LIGULE, a small membranous bract embracing the stem of grasses and forming part of the sheath.

Limb, the broader part of a petal or leaf.

Linear, very narrow and with parallel edges.

Lobes, the divisions of a leaf, calyx, or corolla in a broad sense.

Lyrate, applied to a pinnatifid leaf with a rounded terminal lobe and smaller divisions towards the base, as in *Geum montanum*.

Membranous, thin and transparent like a membrane.

Midrib, the principal vein of a leaf.

Monocotyledon, a plant having only one seed-leaf. Grasses, Sedges, Lilies, and many bulbous and tuberous plants are Monocotyledons.

Monœcious plants are those which have the stamens and pistil in separate flowers, but on the same plant.

Mucronate, suddenly terminated by a short and stiff point or needle, called a *mucro*. In leaves it is the prolongation of the midrib.

Naturalised, of foreign origin, but established and growing naturally in a country.

Nectary, an organ secreting nectar or honey.

Nitrogenous, containing nitrogen.

Node, the point of insertion of a leaf on a stem.

Nut, a dry fruit with a hard, woody shell or pericarp.

Obcordate, inversely heart-shaped.

Obovate, inversely egg-shaped.

Obtuse, more or less rounded at the top.

Offset, the bud at the end of a runner or stolon.

Opposite, applied to leaves which are in pairs at the same level on the stem; cf. Alternate.

Orbicular, round, spherical.

Ovary, a carpel enclosing one or more ovules.

Ovule, the embryo seed enclosed in the ovary.

Paleaceous, chaffy.

Paleæ, or Chaff, the inner bracts or scales in *Compositæ*, *Gramineæ*, etc.

Palmate, divided like a hand into several lobes.

Panicle, a branched raceme.

Pappus, a feathery appendage of the seed of many *Compositæ*.

Parasite, a plant living on or in another (the host) from which it derives part of its food; e.g. *Orobanche*. Semi-parasites include *Pedicularis*, *Rhinanthus*, *Euphrasia*, etc.

Patent, spreading open.

Pectinate, finely divided like the teeth of a comb.

Pedicel, the stalk of a flower in a compound inflorescence.

Peduncle, the stalk of an inflorescence, or of a solitary flower.

Peltate, applied to leaves which are more or less round, with the stalk in the middle (*Hydrocotyle*).

Perfoliate, when the stem passes through a pair of leaves, as in *Chlora perfoliata.*

Perianth, the floral envelope replacing the calyx and corolla in the Monochlamydeæ and Monocotyledons; e.g. the flower of a Crocus.

Pericarp, the wall of the developed ovary as seen in the fruit.

Perennial, lasting more than two years.

Persistent, not falling off.

Petal, a unit of the corolla.

Petaloid, in the colour or form of a petal.

Petiolate, having a leaf-stalk.

Petiole, a leaf-stalk.

Phanerogam, a flowering plant.

Pilose, sparsely covered with rather long hairs.

Pinnate, when several segments succeed each other on each side of a petiole, compared to the branches of a feather.

Pinnatifid, lobed in a pinnate manner.

Pistil, the gynœcium, comprising the ovary, style, and stigma.

Placenta, the portion of the ovary to which the ovules are attached.

Pollen, fertilising powder contained in the anthers.

Pollination, the act of dusting the stigma with pollen.

Pollinium, the pollen-mass of an Orchid.

Polygamous, bearing hermaphrodite and unisexual flowers at the same time.

Polymorphic, variable in shape or form.

Polypetalous flowers have the petals free from one another.

Premorse, bitten off.

Prickle, a sharply pointed excrescence on a branch or leaf, etc.

Pteridophytes, Fern plants.

Puberulent, feebly pubescent.

Pubescent, downy, furnished with fine, soft, short hairs.

Raceme, an inflorescence in which stalked flowers are borne on a central stem, the lowest flowers opening first.

Rachis, the stalk of a compound leaf; the primary axis of certain kinds of inflorescence.

Radical, springing from the root.

Radicle, the embryo root.

Ray Florets, the outer flowers of the *Compositæ;* cf. Disc Florets.

Receptacle, the top portion of the axis of a flower which bears the floral envelope and the male and female organs; also the axis bearing the florets in *Compositæ.*

Reflexed, bent back.

Regular, divided equally.

Reniform, kidney-shaped or bean-shaped.

Reticulated, like a network.

Retuse, very obtuse or truncate and slightly indented.

Rhizome, a creeping, prostrate underground stem, bearing erect shoots.

Ringent, strongly 2-lipped and gaping.

Rootstock, the rhizome ; or the crown of the root.

Rosette, a somewhat circular group of leaves arranged in a close and spreading manner, often flat on the ground ; e.g. *Ramondia*.

Rostrate, beaked.

Rugose, wrinkled.

Runcinate, pinnatifid, with the lobes pointing backwards ; e.g. a Dandelion leaf.

Runner, a slender, prostrate, and generally rooting stem-branch.

Sagittate, arrow-shaped.

Scabrous, rough to the touch.

Scale, a thin, disc-like growth on the exposed surface of some leaves and stems.

Scape, a naked flower-stem springing direct from the root and bearing a single flower.

Scarious, thin and more or less transparent and not green ; scaly.

Seed, a fertilised ovule.

Sepal, one of the calyx-leaves.

Serrate, edged like a saw.

Sessile, stemless.

Setaceous, like a bristle.

Shrub, a woody perennial plant without a main trunk.

Silicule, a short seed-pod in Cruciferous plants, such as *Draba;* adj. Siliculose.

Siliqua, a linear seed-pod in Cruciferous plants, such as Wallflower ; adj. Siliquose.

Sinuous or Sinuate, wavy ; when teeth on the margin of a leaf are broad and irregular.

Spadix, a fleshy spike, as in *Arum maculatum*.

Spathe, a sheath-like leaf enveloping a flower, as in *Arum*.

Spathulate, broadened in the short upper half and narrowly contracted below.

Species, a unit of a genus of greater or less affinity.

Spermatophytes, seed-plants.

Spike, a simple inflorescence of sessile flowers attached to a simple axis.

Spores, the powdery grains of Mosses, Ferns, etc., which correspond to the 'seeds' in flowering plants.

Spur, a prolonged portion of a flower, usually somewhat tubular.

Stamen, the male organ of a flower considered as a whole.

Standard, the large upper petal of a Leguminous flower.

Stellate, star-shaped ; often applied to certain hairs.

STERILE, having stamens, but no pistils; barren.

STIGMA, the receptive upper portion of a pistil, where the pollen is dusted. The adj. stigmatic means sticky.

STIPULATE, possessing stipules.

STIPULES, leaf-like appendages, often in pairs and winged at the junction of leaves with the stem.

STOLON, a horizontal runner or stem-branch.

STOMATA, the minute pores in the epidermis of a leaf, especially on the under side; sing. STOMA.

STRIATE, marked with parallel longitudinal lines.

STYLE, the central portion of the pistil which bears the stigma.

SUBULATE, awl-shaped.

SUPERIOR, applied to an ovary which is free from and not enclosed by the floral envelope.

TAPROOT, the main descending root.

TEETH, small pointed lobes on the margins of leaves, etc.

TENDRIL, a thread-like organ used for climbing.

TERETE, long and cylindrical.

TERNATE, in threes.

TESTA, the outer coat of seeds.

THALAMUS, the receptacle.

THALLUS, a vegetative body not differentiated into stem and leaf.

THORN, a sharply pointed extremity of a branch or stalk having a woody centre; a spine.

THROAT, the upper part of a corolla-tube.

THYRSOID, applied to a narrow, pyramidal panicle, such as the inflorescence of *Campanula thyrsoides*.

TOMENTOSE, covered with tomentum or dense, white hair.

TOMENTUM, a thick coating of short, cottony hairs, usually whitish or grey; e.g. Edelweiss.

TRANSPIRATION, the act of giving off water from the leaves of a plant, through the stomata.

TRIFID, 3-cleft.

TRUNCATE, ending abruptly, as if cut off square.

TUBER, a short, thick underground stem containing food material, such as an Artichoke.

TUBERCULATE, covered with small obtuse, wart-like excrescences.

UMBEL, an inflorescence in which the flower-stalks radiate from a common point and are nearly of the same length; e.g. Carrot.

UNCINATE, hooked.

UNILATERAL, one-sided.

UNISEXUAL FLOWERS are those which contain either male or female organs, but not both.

URCEOLATE, pitcher-shaped, or urn-shaped.

VASCULAR, built up of vessels.
VERMICULAR or VERMIFORM, worm-like.
VERNATION, the state of leaves in bud.
VERRUCOSE, warty.
VERSATILE anthers are those which are balanced on the filament.
VERTICILLATE, whorled.
VESICLE, a bladder.
VILLOUS, shaggy.
VISCOUS, sticky, clammy.
VIVIPAROUS, applied to the production of young plants (not seeds) attached to the parent plant.

WHORL, three or more leaves or flowers arranged around the stem on the same level ; e.g. *Galium*, *Gentiana lutea*.
WING, a prolongation of a fruit or seed or of a stem ; the side petal of a Leguminous flower.
WOOLLY, when the hairs are long and loose, like wool.